CHICAGO O'HARE INTERNATIONAL AIRPORT
REQUEST FOR MODIFICATION TO STANDARDS (MOS)

AERONAUTICAL STUDY 2003-AGL-0878-NRA
O'Hare Modernization Program (OMP)

June 6, 2005

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I. REQUESTS FOR NEW MOS

1. FUTURE RUNWAY 9L-27R - CAT II RUNWAY TO TAXIWAY SEPARATION

Future Runway 9L-27R and associated taxiway system will be designed to Airplane Design Group V (ADG-V) standards. In accordance with the FAA letter of April 8, 2004[1] a partial parallel taxiway will be provided with a runway taxiway separation distance of 500 feet for the portion of parallel taxiway located west of Taxiway P1 (intersection with Runway 14L).

1.1 PROPOSED MOS

1.1.1 The runway/taxiway separation is shown on the Future ALP (Appendix G). For ADG-V airport design, the standard runway centerline to parallel taxiway centerline separation distance is 400 feet for airports at or below an elevation of 1,345 feet.[2] During CAT II conditions the minimum Height Above Touchdown (HAT) value of 100 feet may be achieved by providing runway taxiway separation of 500 feet for ADG-V aircraft. An HAT of 100 feet may also be achieved with a runway taxiway separation of 400 feet provided taxi operations are conducted in accordance with United States Standards for Terminal Instrument Procedures (TERPS).[3] It is proposed that the west 2,700 feet of parallel taxiway be separated 500 feet from runway centerline.

1.1.2 During CAT II conditions ADG-V aircraft will be allowed to operate unrestricted on the partial parallel taxiway.

1.1.3 The portion of the parallel taxiway located from Existing Taxiway P1 (intersection with Runway 14L) east to the first of two Future Runway 9L high-speed taxi exits as shown on the Future ALP (October 2003) has been removed from consideration and will be depicted as such on the revised ALP Set. The FAA has stated that *"Based on the results of this analysis, and the proposed flow of aircraft on the taxiway network, the FAA has concluded that removing a portion of the parallel taxiway from the intersection of Runway 14L east to the first high speed runway exit preserves the operational efficiency of the airfield."* [4] and has been determined to be the best alternative of those reviewed by the FAA.

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[1] APPENDIX B - FAA Runway/Taxiway Guidance Letter of April 8, 2004 from Mr. Barry Cooper, FAA Manager, Chicago Area Modernization Program Office to Mr. Michael Boland, First Deputy Director, O'Hare Modernization Program, Department of Aviation; Re: Runway/Parallel Taxiway Separation Guidance & Update on the Status of FAA Advisory Circular 150/5300-13; Change 8.

2 AC 150/5300-13 Table 2-2 Note 3: "*For Airplane Design Group V, the standard runway centerline to parallel taxiway centerline separation distance is 400 feet (120 m) for airports at or below an elevation of 1,345 feet (410 m); 450 feet (135 m) for airports between elevations of 1,345 feet (410 m) and 6,560 feet (2 000 m); and 500 feet (150 m) for airports above an elevation of 6,560 feet (2 000 m).*"

[3] APPENDIX A - United States Standards for Terminal Instrument Procedures TERPS Instruction Letter (TIL) 00-005A, Interim Category II/III Obstruction Clearance Criteria, Section 4.1.1c dated September 18, 2000

[4] APPENDIX B - FAA Runway/Taxiway Guidance Letter of April 8, 2004 from Mr. Barry Cooper, FAA Manager, Chicago Area Modernization Program Office to Mr. Michael Boland, First Deputy Director, O'Hare Modernization Program, Department of

1.1.4 For a precision instrument approach, a parallel taxiway is recommended by the FAA's Advisory Circular 150/5300-13.[5] Although a full-length parallel taxiway is not planned, a taxiway system will be provided in accordance with FAA standards to accommodate aircraft if needed, to taxi from one end of the runway threshold to the other without aircraft entering the runway object free zone (OFZ).

1.2 ALTERNATIVES

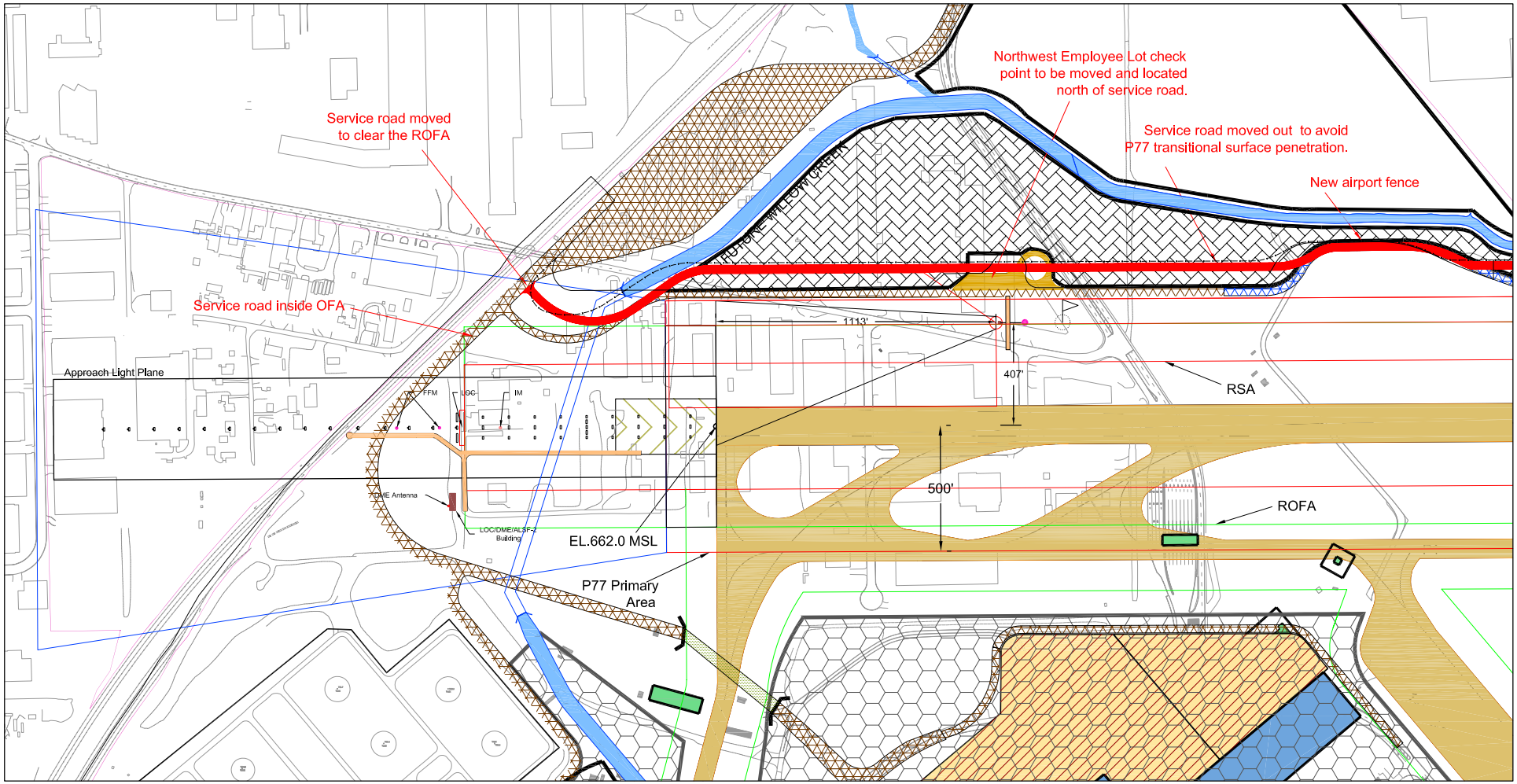
Several alternatives were identified that would allow the construction of a full parallel taxiway having 500 feet runway/taxiway separation. Alternatives assessed included:

1.2.1 Alternative 1: Provide a full-length parallel taxiway having 500-foot runway-to-taxiway separation by moving the runway 100 feet north.

This alternative was rejected due to numerous impacts to constructability if the runway were to be moved 100 feet further north. As shown on **Alternative 1A "Future Runway 9L-27R Impact Assessment West End"** and summarized in **Table 1A,** at the west end of a relocated runway, the service road adjacent to the railroad tracks would be located within the runway object free area (OFA), the service road adjacent to railroad tracks and the east-west perimeter service road would penetrate Part 77 primary approach surface, the east-west perimeter service road north of RW 9L-27R would be located within the 9L glideslope critical area, the Runway 9L glideslope antenna would be within 100 feet of service road creating potential signal interference, the east-west perimeter service road would penetrate 7:1 transitional surface, the employee security checkpoint would be located within the 9L glideslope critical area, the railroad tracks including assumed rail car heights would penetrate Runway 9L Part 77 primary approach surface and realignment of light lanes and NAVAIDS would also be required.

Aviation; Re: Runway/Parallel Taxiway Separation Guidance & Update on the Status of FAA Advisory Circular 150/5300-13; Change 8

[5] AC 150/5300-13 Table A16-1A: "*A parallel taxiway must lead to the threshold and, with airplanes on centerline, keep the airplanes outside the OFZ."*



NOTE: Runway moved 100' north. These exhibits may not illustrate all known impacts.

Source: Chicago O'Hare ALP, October 2003.
Prepared by: Ricondo & Associates, Inc.

Alternative 1A

RICONDO & ASSOCIATES

0 400'

north

N:\CHICAGO\MOVING-9L-27R\...

FUTURE RUNWAY 9L-27R IMPACT ASSESSMENT
WEST END

Runway Impact Study
Runway 9L-27R

March 9, 2004

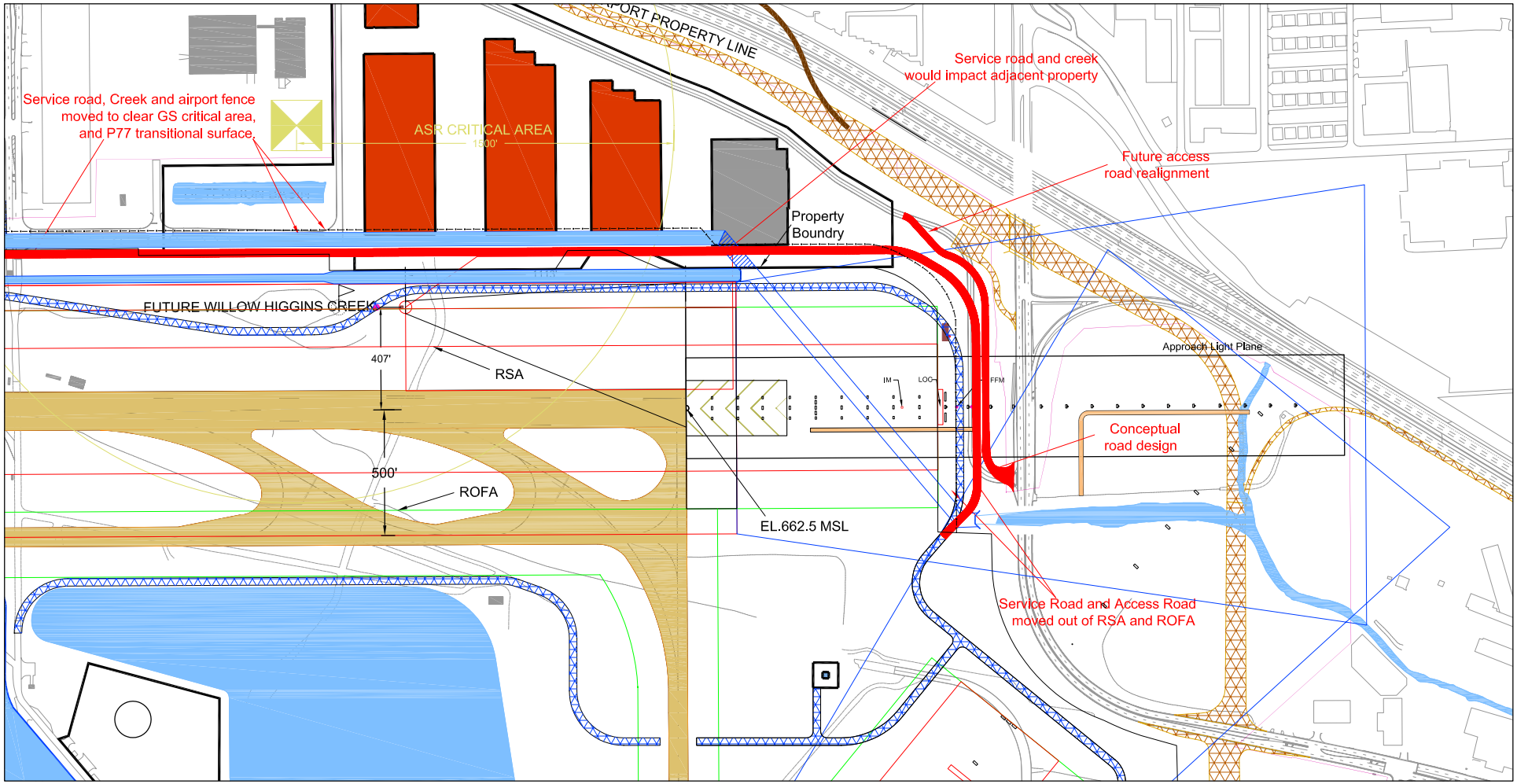
Table 1A: Future Runway 9L-27R Alternative 1A (west end/north)

ITEM	LOCATION	IMPACT
Service Road	west end adjacent to railroad tracks	Runway OFA
Service Road	west end adjacent to railroad tracks	Part 77
Railroad tracks	west of 9L-27R	Part 77
Light lanes	west of 9L-27R	Realignment
Service road	north of 9L-27R	9L Glideslope antenna
E/W Service road	north of 9L-27R	Glideslope critical area
E/W Service road	north of 9L-27R	7:1 transitional surface
Employee checkpt	north of 9L-27R	Glideslope critical area

As shown on **Alternative 1B "Future Runway 9L-27R Impact Assessment East End"** and summarized in **Table 1B**, at the east end of a relocated runway, the east-west perimeter service road would be located within the 9L-27R OFA, the east-west perimeter service road would penetrate Part 77 surface, the East-West perimeter service road would be located within the 27R glideslope critical area, the Runway 27R glideslope antenna would be within 50 feet of the service road, the ASR-9 would need to be relocated to protect penetration of Part 77 transitional surface and realignment of light lanes and NAVAIDS would be required.

Table 1B: Future Runway 9L-27R Alternative 1B (east end/north)

ITEM	LOCATION	IMPACT
E/W Service road	north of 9L-27R	Runway OFA
E/W Service road	north of 9L-27R	Part 77
E/W Service road	north of 9L-27R	Glideslope critical area.
E/W Service road	north of 9L-27R	27R Glideslope antenna
Future Light lanes	east of 9L-27R	Realignment
ASR-9	north of 9L-27R	Relocated



NOTE: Runway moved 100' north. These exhibits may not illustrate all known impacts.

Source: Chicago O'Hare ALP, October 2003.
Prepared by: Ricondo & Associates, Inc.

Alternative 1B

RICONDO & ASSOCIATES

0 400' north

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FUTURE RUNWAY 9L-27R IMPACT ASSESSMENT
EAST END

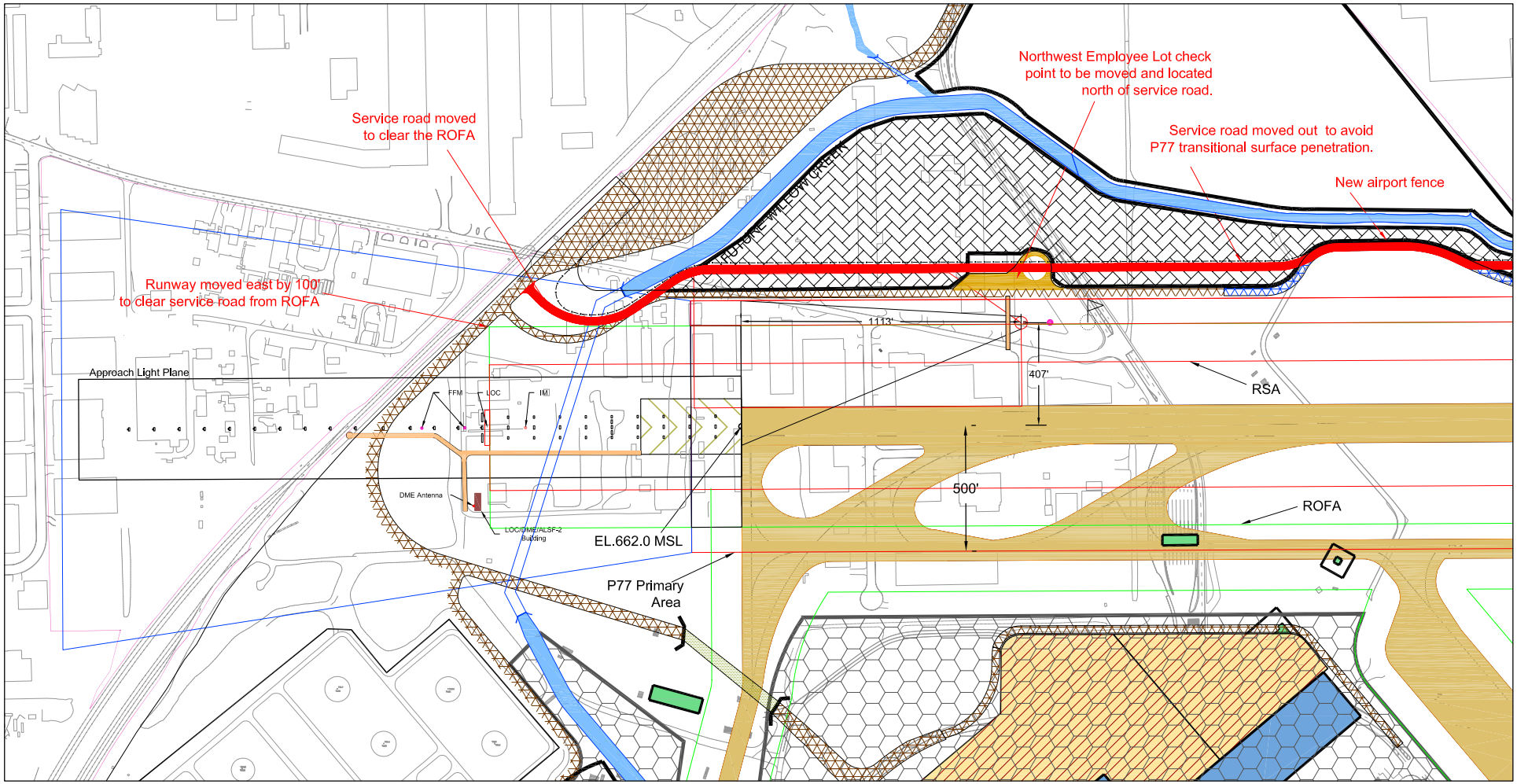
1.2.2 Alternative 2: Provide a full-length parallel taxiway having 500-foot runway-to-taxiway separation by moving the runway 100 feet north and 100 feet east.

This alternative would move the runway 100-feet north as before however as shown in **Alternatives 2A and 2B** and summarized in **Tables 2A and 2B**, the runway would also be moved 100 feet east to provide clearance of the west-end service road adjacent to railroad tracks to the runway OFA. All other aspects at the west end of the runway resulting from moving the runway 100-feet north would remain the same as previously discussed in Section 1.2.1.

Table 2A: Future Runway 9L-27R Alternative 2A (west end/north)

ITEM	LOCATION	IMPACT
Service Road	west end adjacent to railroad tracks	Part 77
Railroad tracks	west of 9L-27R	Part 77
Light lanes	west of 9L-27R	Realignment
Service road	north of 9L-27R	9L Glideslope antenna
E/W Service road	north of 9L-27R	Glideslope critical area
E/W Service road	north of 9L-27R	7:1 transitional surface
Employee ckpoint	north of 9L-27R	Glideslope critical area

As shown on Alternative 2B and summarized in Table 2B, at the east end of the runway, the service road would be located within the RSA and would need to be moved 100 feet further east however the potential for airport development in this area is limited and would require additional land acquisition and/or tunneling of the service road. Additionally, the Runway 9L localizer would be within the RSA and thus would need to be moved 100 feet further east requiring off airport location and/or a non-standard condition. Also, moving the runway east would result in an obstacle penetration (Radisson Hotel) of Part 77 primary surface, the approach lighting system (ALS) and Runway Protection Zone (RPZ) would need to be extended into additional off-airport areas and the Runway Protection Zone (RPZ) would need to be extended into additional off-airport areas. At the east end of the runway, all other impacts resulting from moving runway 100-feet north would remain the same as discussed in Section 1.2.1.



NOTE: Runway moved 100' north and 100' to the east. These exhibits may not illustrate all known impacts.

Source: Chicago O'Hare ALP, October 2003.
Prepared by: Ricondo & Associates, Inc.

Alternative 2A

RICONDO & ASSOCIATES

0 400' north

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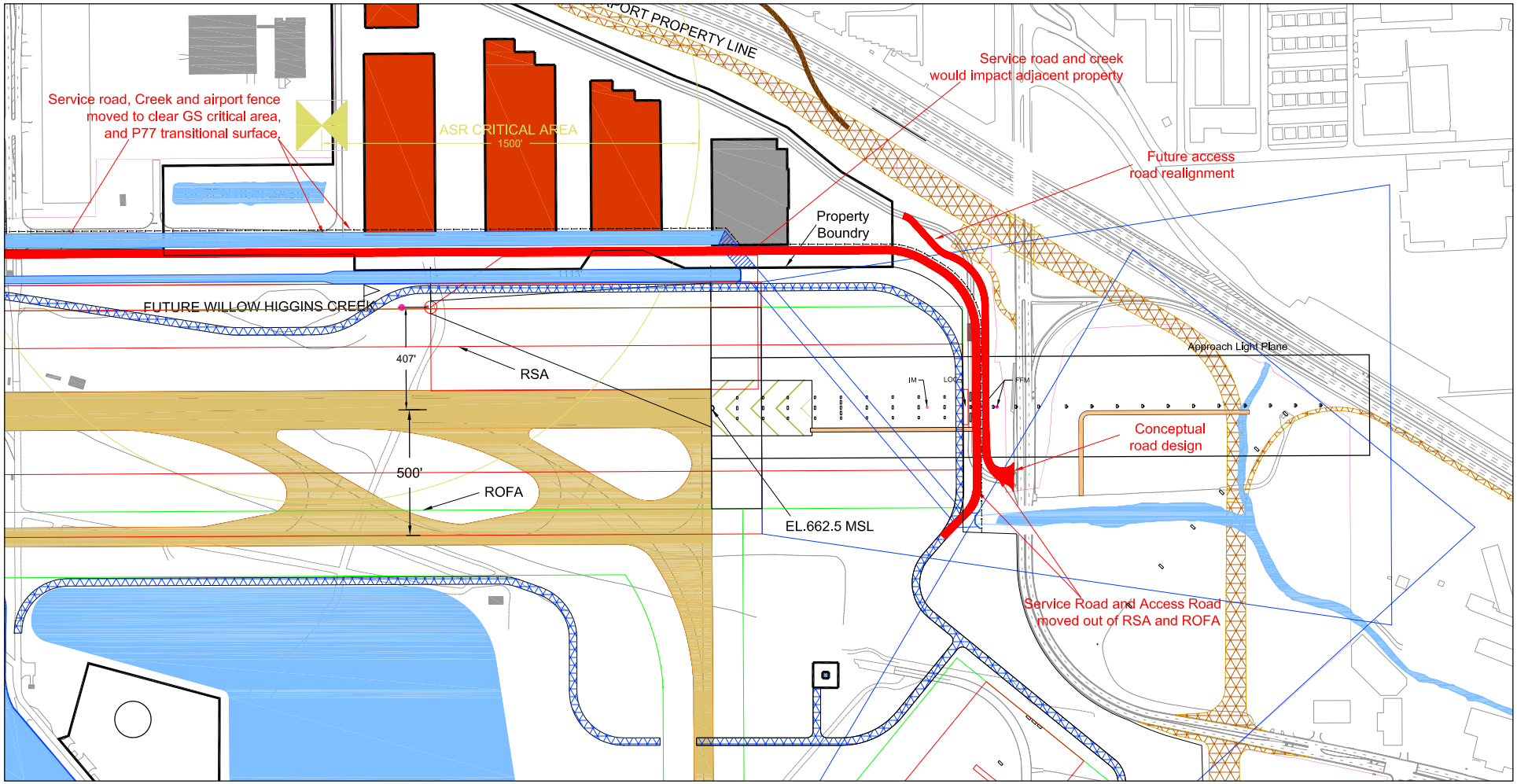
FUTURE RUNWAY 9L-27R IMPACT ASSESSMENT
WEST END

Runway Impact Study
Runway 9L-27R

March 9, 2004



NOTE: Runway moved 100' north and 100' to the east. These exhibits may not illustrate all known impacts.

Source: Chicago O'Hare ALP, October 2003.
Prepared by: Ricondo & Associates, Inc.

Alternative 2B

RICONDO & ASSOCIATES

0 400' north

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FUTURE RUNWAY 9L-27R IMPACT ASSESSMENT
EAST END

Runway Impact Study
Runway 9L-27R

March 9, 2004

Table 2B: Future Runway 9L-27R Alternative 2B (east end/north)

ITEM	LOCATION	IMPACT
Service Road	east of 9L-27R	RSA/off-airport land use
Runway 9L LOC	east of 9L-27R	RSA/off-airport land use
Raddison Hotel	east of 9L-27R	Part 77
ALS	east of 9L-27R	RSA/off-airport land use
RPZ	east of 9L-27R	RSA/off-airport land use
E/W Service road	north of 9L-27R	Runway OFA
E/W Service road	north of 9L-27R	Part 77
E/W Service road	north of 9L-27R	Glideslope critical area.
E/W Service road	north of 9L-27R	27R Glideslope antenna
Future Light lanes	east of 9L-27R	Realignment
ASR-9	north of 9L-27R	Relocated

1.2.3 Alternative 3: As shown in **Alternative 3 "Future Runway 9L-27R Concept Parallel Taxiway 500' Centerline Separation"** a full-length parallel taxiway having 500-foot runway-to-taxiway separation is provided by moving the parallel taxiway 100 feet south.

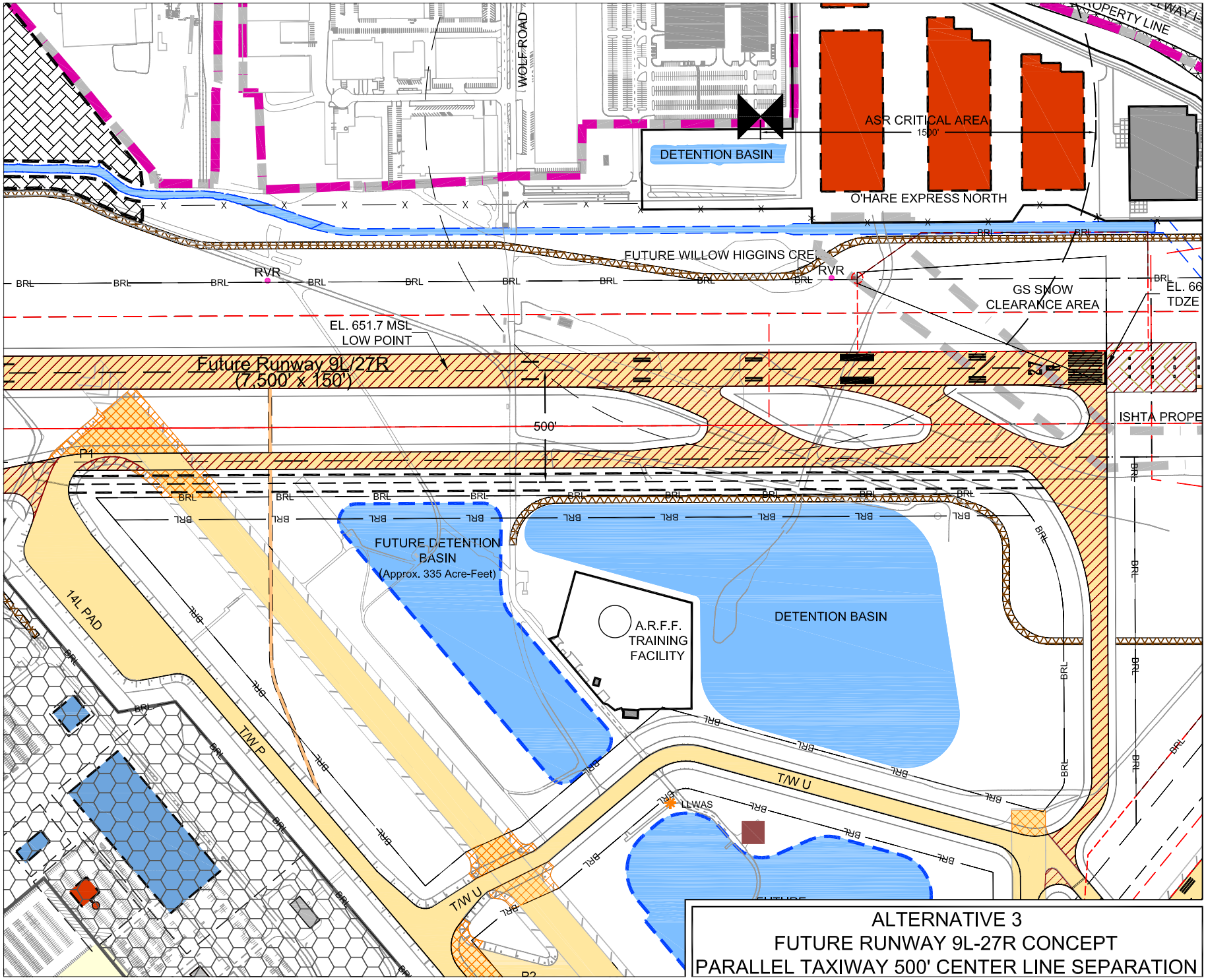
This alternative was rejected due to additional costs associated with reconfiguration of the detention basin and additional pavement requirements for the Runway 9L-27R exit taxiways[6]. It has subsequently been determined by the FAA that removal of this section of parallel taxiway preserves the operational integrity of the airfield.[7]

1.2.4 Alternative 4: As shown in **Alternative 4, "Runway 9L-27R Concept Parallel Taxiway at 500' Centerline Separation"** a partial parallel taxiway having a 500-foot taxiway separation west of intersecting taxiway P1 is provided and all portions of taxiway having less than 500 feet of separation are removed. One high-speed exit taxiway is provided at the east end of the runway.

By providing only one high-speed exit taxiway and one 90-degree exit taxiway located at the end of the runway, no portion of the parallel taxiway

[6]APPENDIX C - Consoer Townsend Envirodyne Engineers, Inc. (CTE) letter of May 15, 2002 from T.J.Parker Associate Vice President to Shawn Kinder, Project Manager, Ricondo & Associates, Inc.

[7] APPENDIX B - FAA Runway/Taxiway Guidance Letter of April 8, 2004 from Mr. Barry Cooper, FAA Manager, Chicago Area Modernization Program Office to Mr. Michael Boland, First Deputy Director, O'Hare Modernization Program, Department of Aviation; Re: Runway/Parallel Taxiway Separation Guidance & Update on the Status of FAA Advisory Circular 150/5300-13; Change 8



ALTERNATIVE 3
FUTURE RUNWAY 9L-27R CONCEPT
PARALLEL TAXIWAY 500' CENTER LINE SEPARATION

DRAWN BY: EB
CHECKED BY: FG
PREPARED BY: Ricondo & Associates, Inc.
October 2003
Sheet 9 of 50

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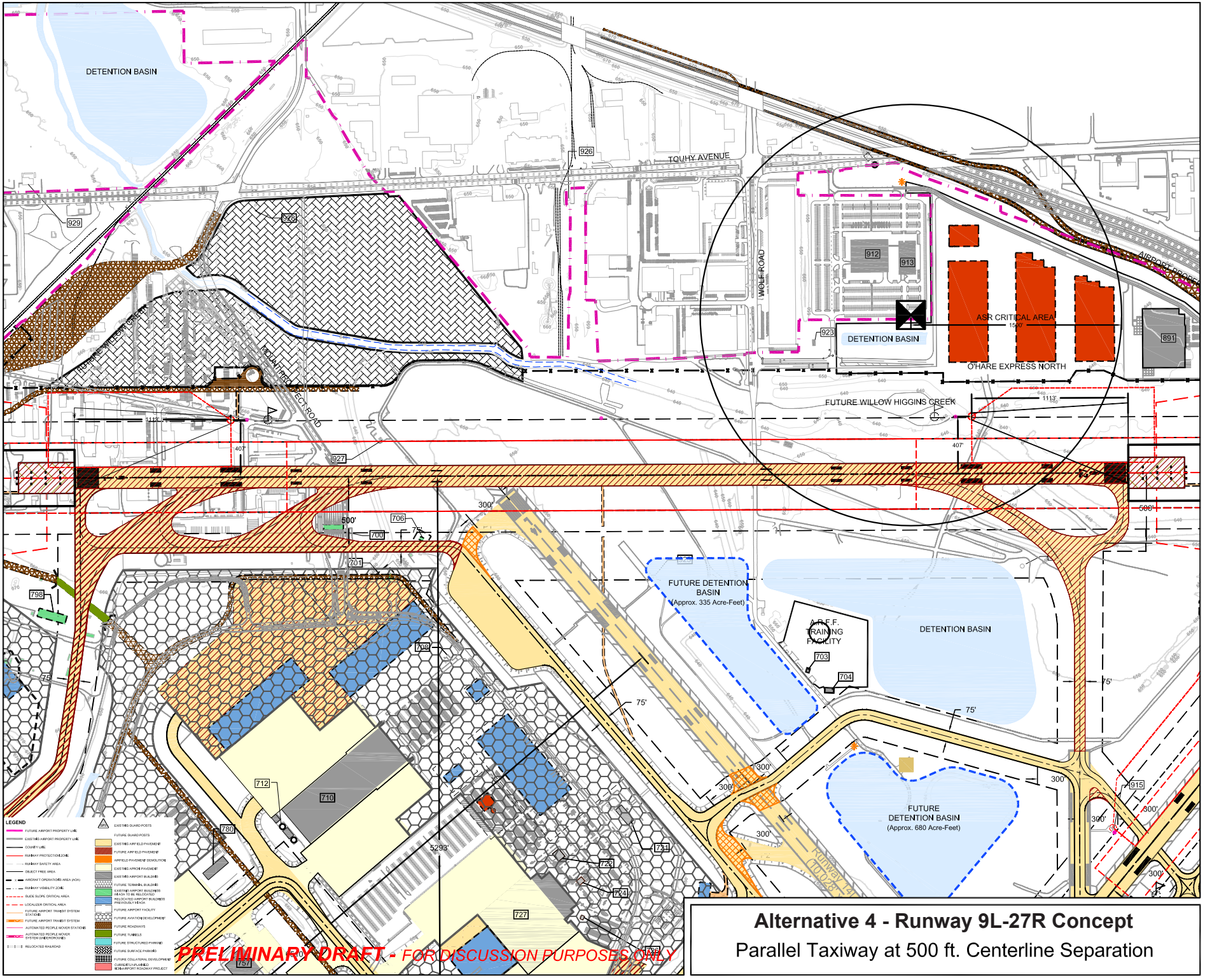
O'Hare International Airport

No.	Revisions	Date

CHICAGO Airport System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TOUHY AVENUE
926
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WOLF ROAD
912
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DETENTION BASIN
ASR CRITICAL AREA
1540'
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O'HARE EXPRESS NORTH
AIRPORT PROPER
FUTURE WILLOW HIGGINS CREEK
MOUNT PROSPECT
1113'
407'
927
500'
706
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701
798
300'
FUTURE DETENTION BASIN
(Approx. 335 Acre-Feet)
A.R.F.F. TRAINING FACILITY
703
704
DETENTION BASIN
75'
709
712
710
780
5293'
734
724
724
727
915
FUTURE DETENTION BASIN
(Approx. 680 Acre-Feet)
Runway 14L-32R
LEGEND
PRELIMINARY DRAFT - FOR DISCUSSION PURPOSES ONLY
Alternative 4 - Runway 9L-27R Concept
Parallel Taxiway at 500 ft. Centerline Separation
PREPARED BY:
Ricondo & Associates, Inc.
July 25, 2003
O'Hare International Airport
Revisions
Date
CHICAGO Airport System

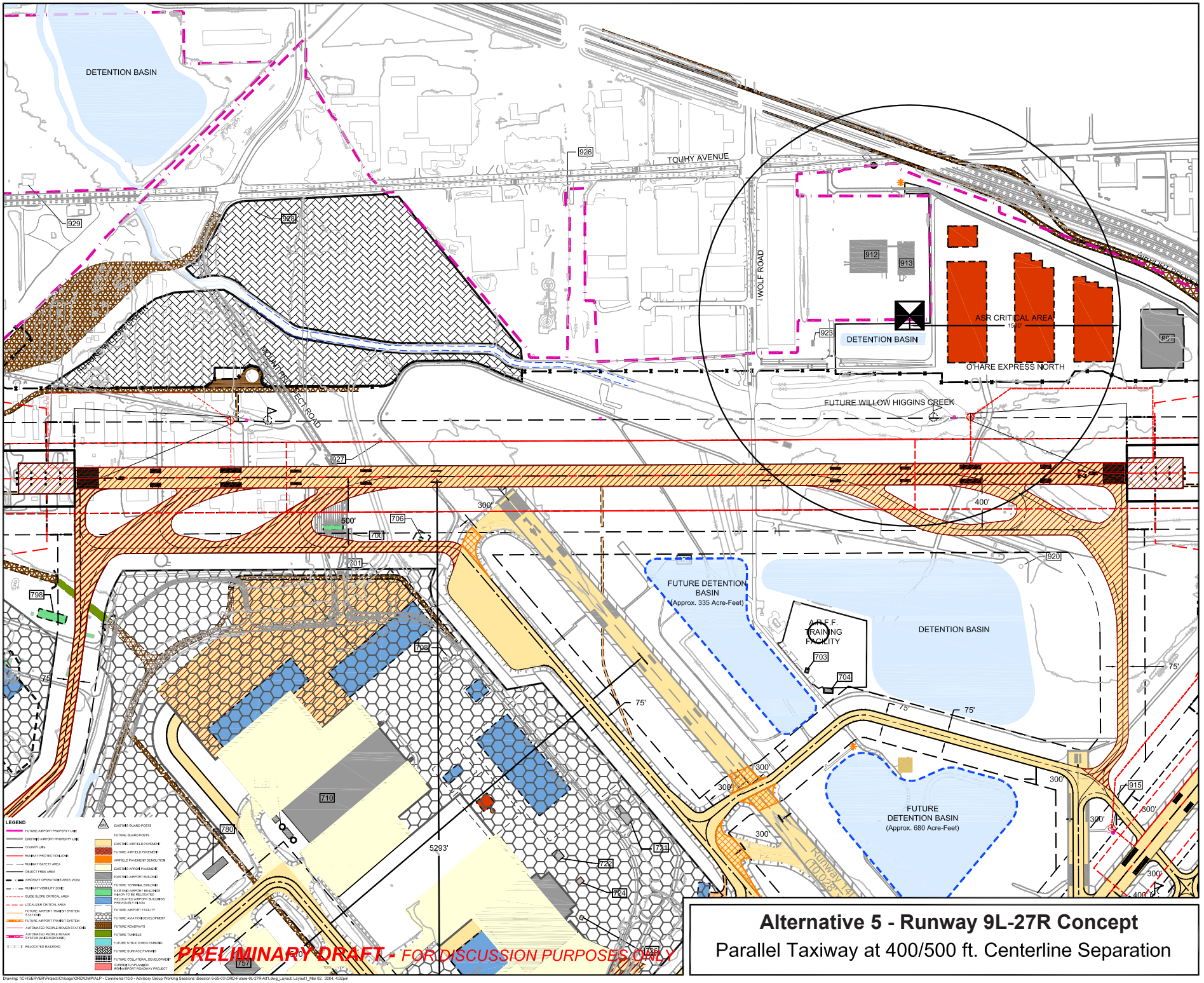
would be less than 500 feet separation from the runway. However, this alternative was rejected after FAA Air Traffic concluded that two high-speed runway exits should be provided to maintain operating efficiency by ensuring minimum Runway Occupancy Time (ROT).

1.2.5 Preferred Alternative 5: As shown on the preferred alternative, **Alternative 5, "Runway 9L-27R Concept Parallel Taxiway at 400/500' Centerline Separation"** the partial parallel taxiway has 500-foot runway-to-taxiway separation west of Taxiway P1 (intersecting Runway 14L). The portion of taxiway east of Taxiway P1 shown on the October 2003 Future ALP having 400-foot runway/taxiway separation has been removed. *"Based on the results of this analysis, and the proposed flow of aircraft on the taxiway network, the FAA has concluded that removing a portion of the parallel taxiway from the intersection of Runway 14L east to the first high speed runway exit preserves the operational efficiency of the airfield."* [8] and has been determined to be the best alternative of those reviewed by the FAA. The alternative removing the portion of parallel taxiway will be shown on the ALP Set revision.

1.2.6 Alternative 6: As shown on the October 2003 Future ALP, provide a full-length parallel taxiway having 400-foot runway-to-taxiway separation at the east end, raise the HAT value and permit ADG-V taxi during CAT II.

This alternative would require an assessment based on results of a Collision Risk Model (CRM) and per TERPS would most likely result in CAT II HAT minimums to be raised if ADG-V aircraft were permitted to operate unrestricted on runway/taxiway separation of 400-feet. The alternative to raise the CAT II HAT minimums was rejected because it was determined that it was not operationally necessary to accommodate ADG-V on the parallel taxiway during CAT II and because raising the CAT II HAT minimums would have a negative impact on CAT II arrival throughput.

[8] APPENDIX B - FAA Runway/Taxiway Guidance Letter of April 8, 2004 from Mr. Barry Cooper, FAA Manager, Chicago Area Modernization Program Office to Mr. Michael Boland, First Deputy Director, O'Hare Modernization Program, Department of Aviation; Re: Runway/Parallel Taxiway Separation Guidance & Update on the Status of FAA Advisory Circular 150/5300-13; Change 8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WOLF ROAD
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DETENTION BASIN
ASR CRITICAL AREA
150'
O'HARE EXPRESS NORTH
FUTURE WILLOW HIGGINS CREEK
927
300'
500'
706
701
400'
920
FUTURE DETENTION BASIN
(Approx. 335 Acre-Feet)
A.R.F.F. TRAINING FACILITY
703
704
DETENTION BASIN
75'
798
708
710
780
5293'
734
724
725
915
FUTURE DETENTION BASIN
(Approx. 680 Acre-Feet)
Runway 14L-32R
(10,000' x 150')
757
LEGEND
PRELIMINARY DRAFT - FOR DISCUSSION PURPOSES ONLY
PREPARED BY:
Ricondo & Associates, Inc.
July 25, 2003
O'Hare International Airport
Alternative 5 - Runway 9L-27R Concept
Parallel Taxiway at 400/500 ft. Centerline Separation

2. Future Runway 9R-27L (Existing Runway 9L-27R) CAT II Runway to Taxiway Separation

Future Runway 9R-27L consists of a 3,594-foot extension to Existing Runway 9L-27R and a renaming of that runway. This runway and additions to the associated taxiway system will be designed to ADG-V standards. Existing Runway 9L-27R has a parallel taxiway located 367 feet south of its centerline. In conjunction with the runway extension and renaming to Runway 9R-27L, this parallel taxiway will be extended to a point abeam the new Runway 9R threshold and the taxiway extension will be located 400 feet south of the runway centerline as shown on the Future ALP (Appendix G). A second parallel taxiway is located 700 feet south of Future Runway 9R at the west end.

2.1 PROPOSED MOS

2.1.1 The preferred runway/taxiway separation alternative is shown on the Future ALP (Appendix G). For ADG-V airport design, the standard runway centerline to parallel taxiway centerline separation distance is 400 feet for airports at or below an elevation of 1,345 feet.[9] During CAT II conditions the minimum Height Above Touchdown (HAT) value of 100 feet may be achieved by providing runway taxiway separation of 500 feet for ADG-V aircraft. An HAT of 100 feet may also be achieved with a runway taxiway separation of 400 feet provided taxi operations are conducted in accordance with TERPS.[10]

2.1.2 During CAT II/III conditions, ADG V aircraft will be able to taxi unrestricted on the second parallel taxiway at the west end located south of Future Runway 9R-27L and separated by 700 feet.

2.1.3 During conditions better than CAT II[11] ADG-V aircraft will be permitted to operate unrestricted along the portion of the parallel taxiway that is separated from the runway by 400 feet.

2.1.4 During conditions better than CAT II for the portion of parallel Taxiway H that is 367 feet from runway centerline, it is proposed that existing operations that permit ADG-V aircraft to taxi on Taxiway H unrestricted be maintained.[12]

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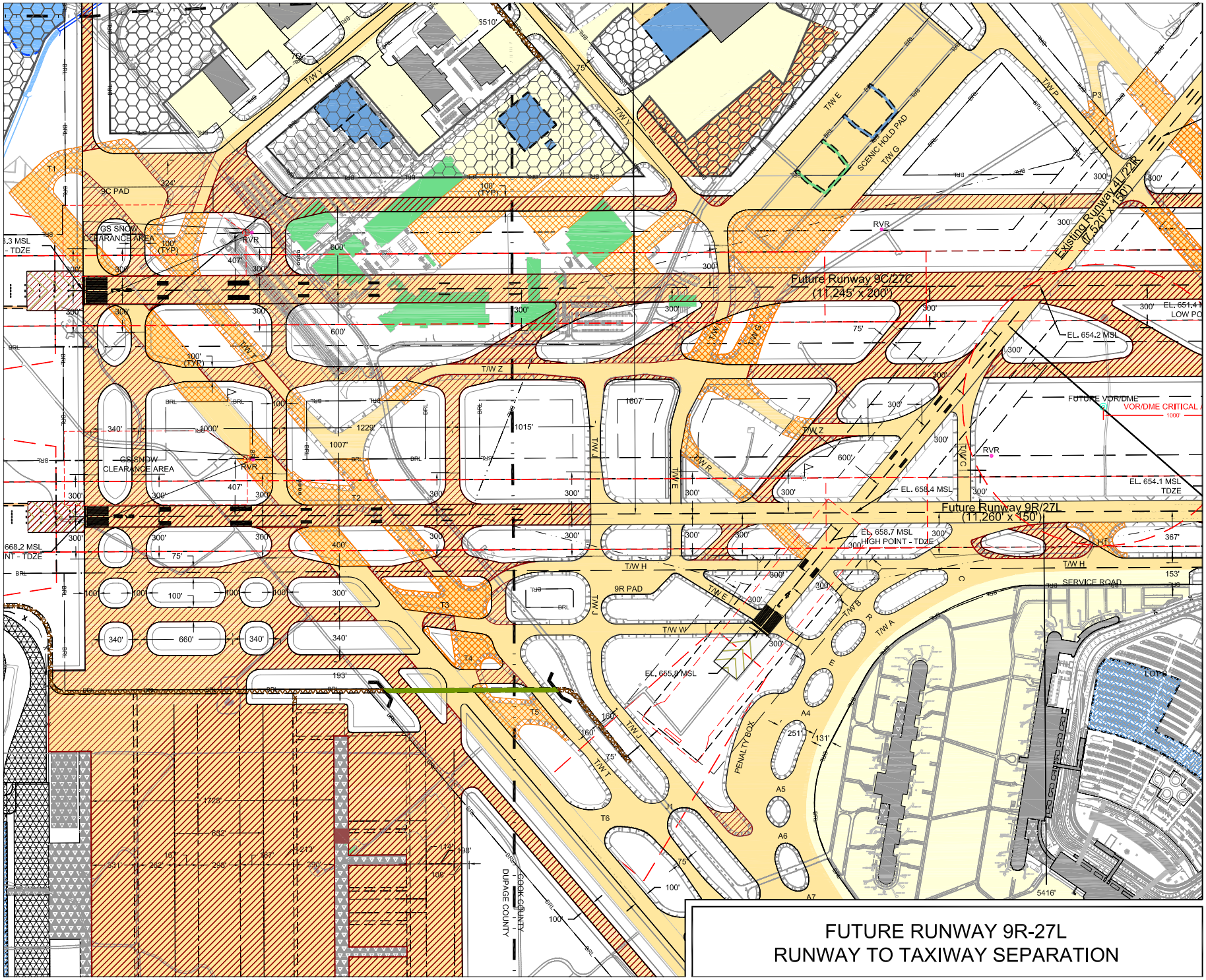
9 AC 150/5300-13 Table 2-2 Note 3: "*For Airplane Design Group V, the standard runway centerline to parallel taxiway centerline separation distance is 400 feet (120 m) for airports at or below an elevation of 1,345 feet (410 m); 450 feet (135 m) for airports between elevations of 1,345 feet (410 m) and 6,560 feet (2 000 m); and 500 feet (150 m) for airports above an elevation of 6,560 feet (2 000 m).*"

10 APPENDIX A - United States Standards for Terminal Instrument Procedures TERPS Instruction Letter (TIL) 00-005A, Interim Category II/III Obstruction Clearance Criteria, Section 4.1.1c dated September 18, 2000

11 Weather conditions better that CAT II account for 99.12% of O'Hare weather occurrences. Source: FAA FINAL Environmental Assessment, "Upgrade Runways 27L & 27R from a Category I Approach to Category II/III Approach." (10/01/04).

12 This condition is contingent upon any and all other restrictions currently in place including an existing restriction that states "When the portion of Runway 9L-27R between Runway 18-36 and Taxiway C is not visible from the tower, ensure operations are not conducted on that runway when taxiing aircraft are using Taxiway H between Taxiway H1 and Taxiway C." Source: FAA Order 7110.65C



FUTURE RUNWAY 9R-27L
RUNWAY TO TAXIWAY SEPARATION

DRAWN BY: EB
CHECKED BY: FG
PREPARED BY: Ricondo & Associates, Inc.
October 2003
Sheet 9 of 50

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2.2 ALTERNATIVES

Alternatives were identified that would allow construction of a runway/taxiway separation of 500 feet. Alternatives assessed included:

2.2.1 Alternative 1**:** Provide full-length 500-foot runway-to-taxiway separation by moving the runway 133 feet north.

This alternative was considered impractical due to the cost considerations required to move Existing Runway 9L-27R.

2.2.2 Alternative 2**:** Provide 500-foot runway-to-taxiway separation for the west taxiway extension by moving this portion of taxiway 100 feet further south.

This alternative was rejected due to encroachment on two new future second and third parallel taxiways and Western Terminal development located at the west end of the runway and shown on the Future ALP (Appendix G)**.** Furthermore as shown on the Existing ALP (Appendix F) there is insufficient developmental area to provide 500 feet of runway/taxiway spacing without encroaching on off-airport property and I190 commercial roadway.

An alternative was evaluated to permit ADG-V aircraft to taxi unrestricted with runway/taxiway separation of 400 feet:

2.2.3 Alternative 3**:** Provide 400-foot runway-to-taxiway separation for the west taxiway extension, raise the HAT value and permit ADG-V aircraft to taxi unrestricted on the parallel taxiway.

This alternative would require an assessment based on results of a Collision Risk Model (CRM) and most likely result in CAT II HAT minimums to be raised if ADG-V CAT II were to operate unrestricted. The alternative to raise the CAT II HAT minimums was rejected because it was determined that it was not operationally necessary to accommodate ADG-V aircraft on the parallel taxiway during CAT II and because raising the CAT II HAT minimums would have a negative impact on CAT II arrival throughput.

3. FUTURE RUNWAY 10L-28R (EXISTING RUNWAY 9R-27L) CAT II RUNWAY TO TAXIWAY SEPARATION

Future Runway 10L-28R and additions to the associated taxiway system will be designed to ADG-V standards. Examples of ADG-V aircraft include the Boeing B747 and Airbus A340 aircraft. A full-length 13,000-foot parallel taxiway will be provided with a separation distance of 500 feet from the runway centerline for the west 9,250 feet of taxiway and 400-foot separation for the east 3,750 feet of relocated Taxiway M as shown on the Future ALP (Appendix G).

3.1 Proposed MOS

3.1.1 The preferred runway/taxiway separation alternative is shown on the Future ALP (Appendix G). For ADG-V airport design, the standard runway centerline to parallel taxiway centerline separation distance is 400 feet for airports at or below an elevation of 1,345 feet.[13] During CAT II conditions the minimum Height Above Touchdown (HAT) value of 100 feet may be achieved by providing runway taxiway separation of 500 feet for ADG-V aircraft. An HAT of 100 feet may also be achieved with a runway taxiway separation of 400 feet provided taxi operations are conducted in accordance with TERPS.[14]

3.1.2 During CAT II/III conditions, ADG-V aircraft will be able to taxi unrestricted on the second and third parallel taxiways located north of Future Runway10L-28R that are separated by 667 feet and 1,053 feet. ADG-V aircraft will also be able to taxi unrestricted on the parallel taxiway located south of Future Runway10L-28R that is separated by 600 feet.

3.1.3 During conditions better than CAT II[15], ADG-V aircraft will be permitted to operate unrestricted along the portion of the parallel taxiway that is separated from the runway by 400 feet.

3.2 ALTERNATIVES

Alternatives were identified that would allow construction of 500-foot runway/taxiway separation. Alternatives assessed included:

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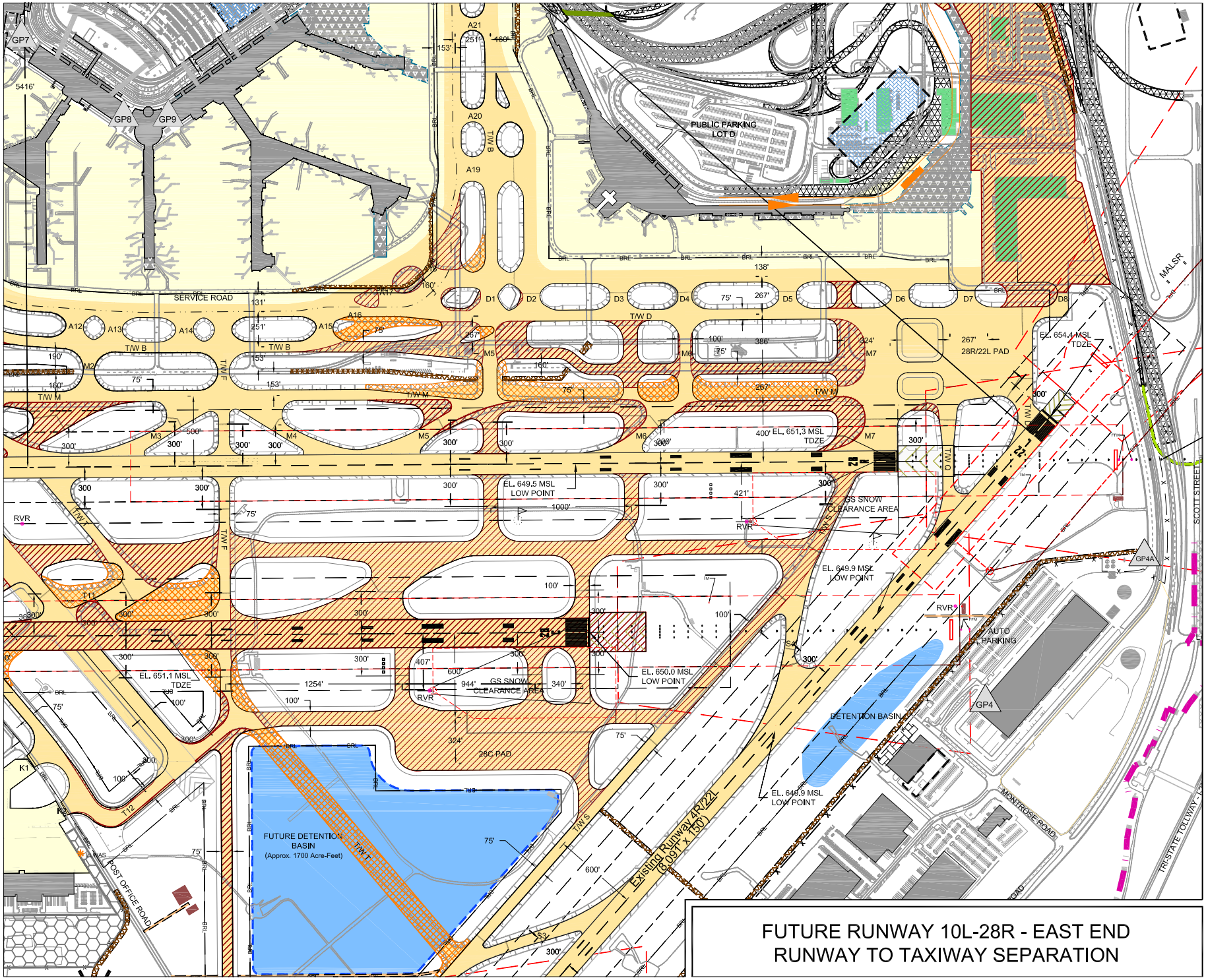
13 AC 150/5300-13 Table 2-2 Note 3: "*For Airplane Design Group V, the standard runway centerline to parallel taxiway centerline separation distance is 400 feet (120 m) for airports at or below an elevation of 1,345 feet (410 m); 450 feet (135 m) for airports between elevations of 1,345 feet (410 m) and 6,560 feet (2 000 m); and 500 feet (150 m) for airports above an elevation of 6,560 feet (2 000 m).*"

14 APPENDIX A - United States Standards for Terminal Instrument Procedures TERPS Instruction Letter (TIL) 00-005A, Interim Category II/III Obstruction Clearance Criteria, Section 4.1.1c dated September 18, 2000

15 Weather conditions better that CAT II account for 99.12% of O'Hare weather occurrences. Source: FAA FINAL Environmental Assessment, "Upgrade Runways 27L & 27R from a Category I Approach to Category II/III Approach." (10/01/04).



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No.	Revisions	Date

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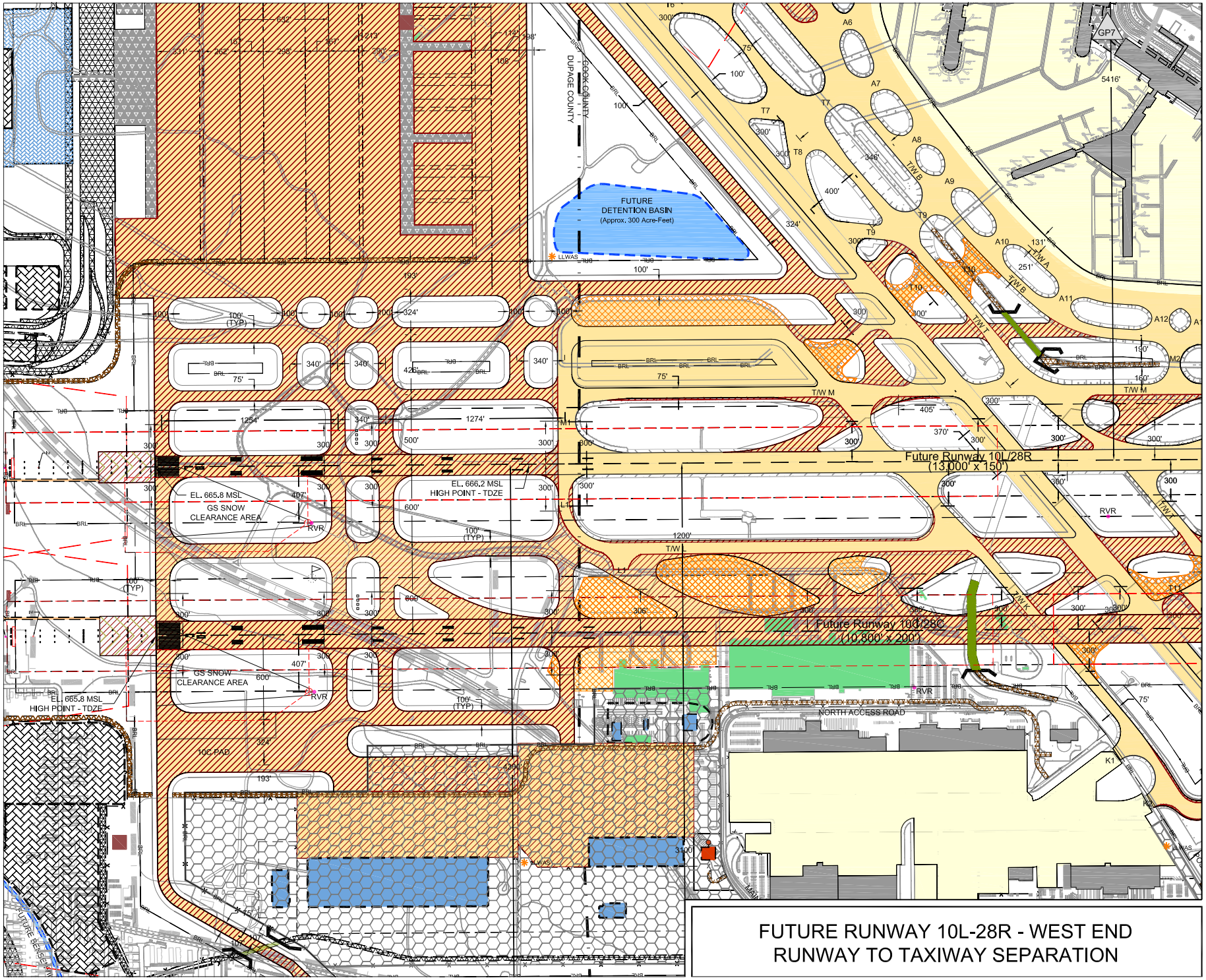
FUTURE RUNWAY 10L-28R - EAST END
RUNWAY TO TAXIWAY SEPARATION



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FUTURE RUNWAY 10L-28R - WEST END
RUNWAY TO TAXIWAY SEPARATION

3.2.1 Alternative 1**:** Provide a 500-foot runway-to-taxiway separation for the east 3,750-foot portion of parallel taxiway by maintaining Taxiway M in its existing location.

As shown on the Existing ALP, while the separation from existing Runway 9R-27L to existing parallel Taxiway M located at the east end is currently 500 feet, as shown on the Future ALP, this portion of taxiway will be relocated 400 feet from the runway to accommodate a second parallel taxiway between relocated parallel Taxiway M and existing Taxiway D. This additional taxiway is required for future air traffic operational needs, therefore this alternative was rejected since it would preclude development of that taxiway.

3.2.2 Alternative 2**:** Provide a 400-foot runway-to-taxiway separation for the east 3,750-foot portion of taxiway extension, raise the HAT value and permit ADG-V aircraft to taxi on the parallel taxiway during CAT II.

This alternative would require an assessment based on results of a Collision Risk Model (CRM) and most likely result in CAT II HAT minimums to be raised if ADG-V aircraft were to operate on the portion of taxiway separated 400-feet from the runway during CAT II conditions. The alternative to raise the CAT II HAT minimums was rejected because it has been determined that raising the CAT II HAT minimums would have a negative impact on CAT II arrival throughput.

4. FUTURE RUNWAY 22R LOCALIZER

As depicted on the Future ALP (Appendix G), the Runway 22R localizer is to be relocated 967 feet from the Runway 4L threshold and 33 feet inside the Runway Safety Area (RSA).

4.1 PROPOSED MOS

The proposed location for the Runway 22R Localizer is shown on the Future ALP (Appendix G). Based on an assessment of alternatives, it is proposed that an FAA MOS be granted for the relocation of the Runway 22R localizer. *"Due to the location of the proposed West Terminal and the air traffic requirements of existing and future taxiway infrastructure in this area, this location appears to be the only feasible and prudent siting alternative available."*[16] If modifications are proposed, all efforts will be made to site the localizer outside of the RSA.

4.2 ALTERNATIVES

Alternatives were identified that would place the localizer outside the runway safety area and are shown on **"Runway 22R Localizer Alternatives"**:

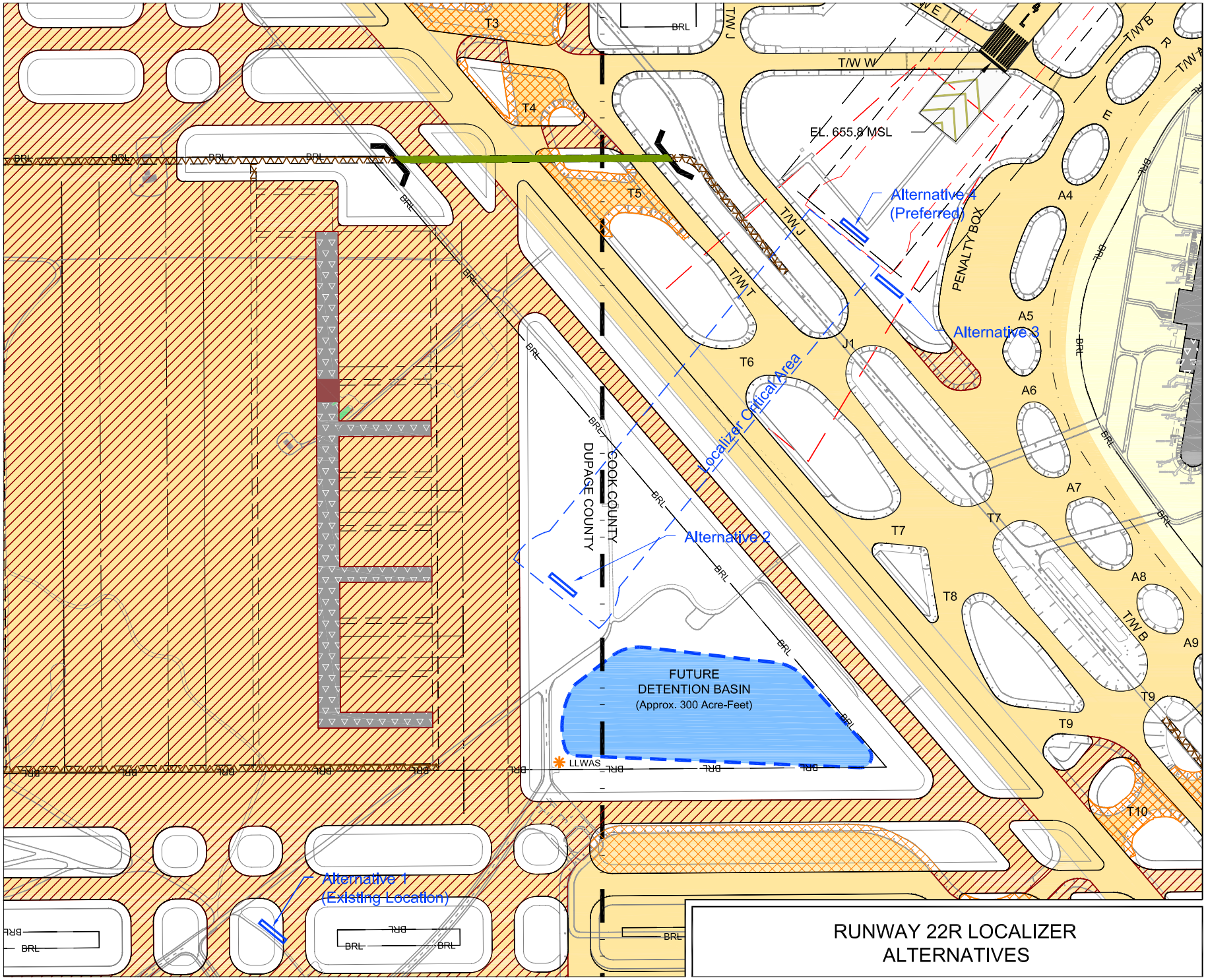
4.2.1 Alternative 1**:** Leave the Runway 22R localizer in its current location (5,000 feet southwest of the Runway 4L threshold.

This alternative was rejected because this location is needed for development of the proposed West Terminal.

4.2.2 Alternative 2**:** Runway 22R localizer placement within the island depicted on Exhibit "Runway 22R Localizer Alternatives" located east of the West Terminal and north of the future detention basin (approximately 3,000 feet southwest of the Runway 4L threshold).

Placing the localizer at this location would be problematic during ILS approaches to Runway 22R. Four parallel taxiways including existing Taxiways J and T and two proposed taxiways will be located within the Runway 22R localizer critical area. Due to the potential localizer signal interference that would be caused by taxiing aircraft, either the taxiways would need to be restricted during Runway 22R arrivals or the aircraft separation on final approach to Runway 22R would need to be increased. Either scenario would result in reduced efficiency of air traffic operations and therefore was not considered an acceptable alternative.

[16] Aeronautical Study 2003-AGL-0878-NRA dated July 22, 2004; Reference FAA Comment 79



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RUNWAY 22R LOCALIZER ALTERNATIVES

4.2.3 Alternative 3**:** Offset the Runway 22R localizer to place the localizer outside the RSA. It is possible to place the localizer outside the RSA by off-setting the localizer approximately 200 feet southeast of the preferred Alternative 4 however, Alternative 3 was rejected because of operational restrictions resulting from the requirement for the Runway 22R CAT I HAT value to be raised and/or a restriction of aircraft from holding in the Runway 4L Hold Pad "Penalty Box".

4.2.4 Preferred Alternative 4: The proposed location for the Runway 22R Localizer is shown on the Future ALP (Appendix G). Based on an assessment of alternatives, this alternative has the least impact on operations.

II. REQUESTS FOR CONTINUATION OF EXISTING MOS

5. TAXIWAY A TO SERVICE ROAD CONCOURSES C, E, F, G, H

The existing separation from Taxiway A to the Terminal Core service road located adjacent to Concourses C, E, F, G and H is 131 feet and does not currently meet the ADG-V standard of 160 feet. Use of Taxiway A by ADG-V aircraft is permitted however, under the terms of an existing Grant of Exemption to FAR Part 139. Separation of 131 feet is acceptable subject to the terms of the Exemption. "*The centerline lights in Taxiway A must be operational for certain aircraft to utilize that taxiway. Those aircraft include A330, A340, B747-400, MD11, and B77."*[17]

5.1 PROPOSED MOS

Taxiway A to the service road separation is shown on the Existing ALP (Appendix F). It is proposed that ADG-V aircraft continue to operate on Taxiway A per the existing terms of a Grant of Exemption.

5.2 ALTERNATIVES

Alternatives were identified to increase the separation between Taxiway A and the service road from 131 feet to an ADG-V standard of 160 feet. Alternatives assessed included:

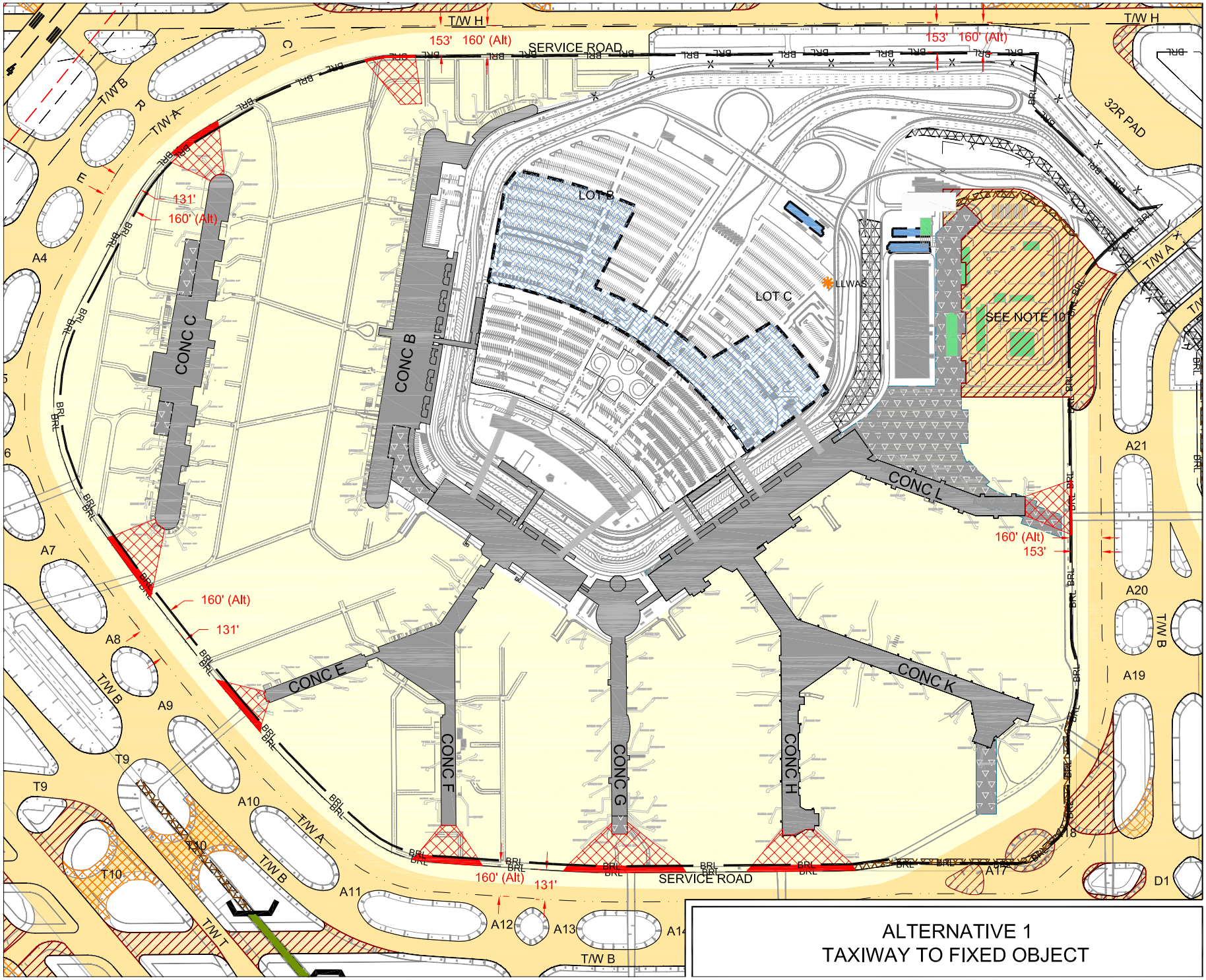
5.2.1 Alternative 1**:** As shown in **"Alternative 1 Taxiway to Fixed Object"** an ADG-V standard 160-foot separation between the taxiway and building restriction line (BRL) is depicted by moving the service road and non-movement aircraft parking area 29 feet further from the Taxiway A.

This alternative was rejected because it would result in the reduction of gate parking and "push-back" capabilities at Concourses C (five gates), Concourse E (two gates), Concourse F (four gates), Concourse G (three gates) and Concourse H (two gates). The airlines would have fewer gating options as in some cases, widebody gates would need to be replaced by narrowbody gates. Furthermore, resultant reduction in pushback area may require aircraft to call for pushback onto the movement area thus increasing workload demands on air traffic.

5.2.2 Alternative 2**:** Provide an ADG-V standard 160-foot taxiway to fixed object separation by moving Taxiway A 29 feet further away from the service road.

In addition to the cost and constructability of relocating Taxiway A, this alternative was rejected as it would result in Taxiway A to be moved 29 feet closer to Taxiway B (from 251 feet to 223 feet) thus creating additional restrictions of ADG-V aircraft on either of these taxiways.

[17] FAA Air Traffic Order 7110.65C



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ALTERNATIVE 1
TAXIWAY TO FIXED OBJECT

6. TAXIWAY A TO SERVICE ROAD - CONCOURSES K AND L TAXIWAY H TO SERVICE ROAD – CONCOURSE B

As shown on the Existing ALP (Appendix F) the separation from Taxiway A centerline to the service road located east of existing Concourses K and L is 153 feet. Similarly, the separation from Taxiway H centerline to the service road located north of Concourse B and along the airport property fence is also 153 feet. This design separation was based on ADG-V standards at the time of taxiway and terminal development; however, that dimension does not meet the current ADG-V separation standard of 160 feet. ADG-V aircraft are permitted to use Taxiways A and H in regard to the 153-foot separation from the service road at Concourses K, L and B subject to existing restrictions of B747 series aircraft on Taxiways A and B discussed in Section 7.1 and subject to aircraft restrictions on Taxiway H as previously discussed in Section 2.1.3.

6.1 PROPOSED MOS

As depicted on the Future ALP (Appendix G), Taxiway A will be moved 160 feet from the relocated non-movement aircraft parking area and service road located adjacent to the future Concourse K extension. However, for the portions of Taxiway A located east of Concourse L and for existing Taxiway H north of Concourse B, it is proposed that a separation of 153 feet from the service road continues to be an acceptable alternative per existing FAA agreements.

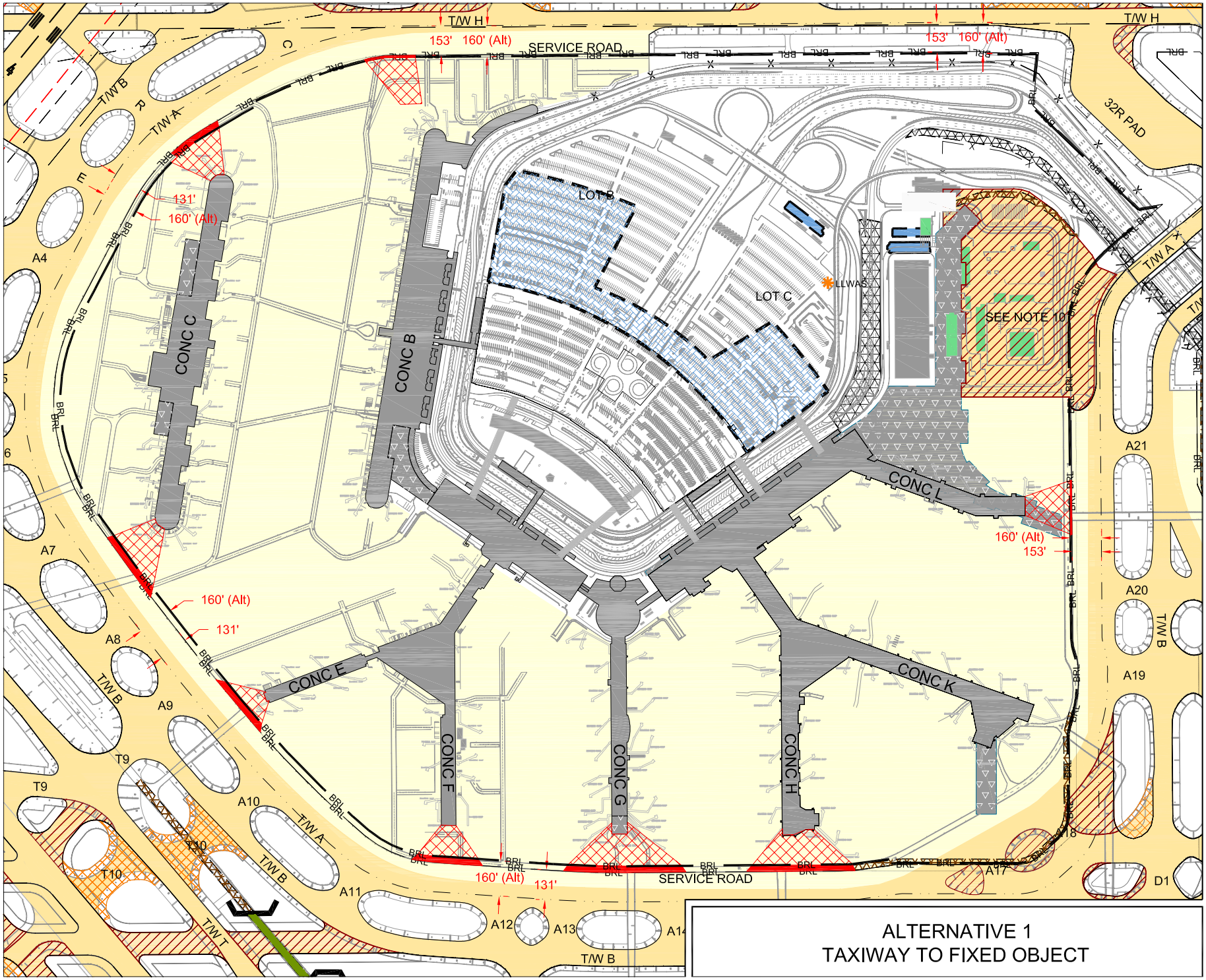
6.2 ALTERNATIVES

Alternatives were identified to increase the separation between Taxiway A and Taxiway H from 153 feet to 160 feet from the service roads. Alternatives assessed included:

6.2.1 Alternative 1**:** As shown on **"Alternative 1 Taxiway to Fixed Object"** an ADG-V standard 160-foot taxiway to fixed object separation is depicted by moving the service road and non-movement aircraft parking areas located at Concourses L and B, seven feet further from Taxiways A and H respectively.

This alternative was rejected because it would result in the reduction of gate parking and "push-back" capabilities at Concourse L (two gates) and Concourse B (gate B17). The airlines would have fewer gating options as in some cases, widebody gates would need to be replaced by narrowbody gates. Furthermore, resultant reduction in pushback area may require aircraft to call for pushback onto the movement area thus increasing workload demands on air traffic. Additionally, Taxiway H is adjacent to the airport property fence and cannot be moved further south without impacting the service road.

6.2.2 Alternative 2**:** Provide an ADG-V standard 160-foot taxiway to fixed object separation by moving Taxiways A and H seven feet further from the service road.



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ALTERNATIVE 1
TAXIWAY TO FIXED OBJECT

6.2.2.1 As depicted on the Future ALP, 160 feet of separation will be provided from the future Concourse K extension by the realignment of the service road and Taxiway A. For other portions of Taxiway A located east of Concourse L, moving Taxiway A closer to Taxiway B (from 251 feet to 244 feet separation) was rejected not only because it would result in taxiway relocation costs, but also because it would create a non-standard taxiway-to-taxiway separation that would need further mitigation or potential loss of taxiway use by ADG-V aircraft.

6.2.2.2 Moving Taxiway H further from the service road was rejected because it would result in Taxiway H being moved closer to Existing Runway 9L-27R (from 367 feet to 360 feet separation). In addition to taxiway relocation costs, this would create a non-standard condition with the runway that would require a collision risk assessment, mitigation and potential loss of taxiway use by certain aircraft.

7. TAXIWAY A TO TAXIWAY B SEPARATION

As shown on the Existing ALP the separation from Taxiway A to Taxiway B centerlines around the Terminal Core area is 251 feet consistent with FAA design criteria in effect at the time the taxiways were built. Since Taxiways A and B were built, ADG-V taxiway-to-taxiway separation criteria was revised to 267 feet, however current use of Taxiways A and B for ADG-V aircraft is permitted subject to existing FAA agreements.

7.1 PROPOSED MOS

The Taxiway A to Taxiway B separation is shown on the Existing ALP (Appendix F). It is proposed that a separation of 251 feet between Taxiways A and B remain an acceptable alternative and ADG-V aircraft continue to operate on Taxiways A and B per existing FAA agreements.[18]

7.2 ALTERNATIVES

Alternatives were identified that would increase the separation of Taxiways A and B from 251 feet to the ADG-V standard of 267 feet. Alternatives assessed included:

7.2.1 Alternative 1**:** Provide an ADG-V standard 267-foot taxiway-to-taxiway separation by moving the non-movement aircraft parking area, the service road and Taxiway A, 16 feet further from Taxiway B.

This alternative was rejected because it would result in the reduction of gate parking and "push-back" capabilities at sixteen gates in the Terminal Core area. These gates include Concourses C (five gates), Concourse E (two gates), Concourse F (four gates), Concourse G (three gates) and Concourse L (two gates). The airlines would have fewer gating options as in some cases, widebody gates would need to be replaced by narrowbody gates. Furthermore, resultant reduction in pushback area may require aircraft to call for pushback onto the movement area thus increasing workload demands on air traffic.

7.2.2 Alternative 2**:** Provide an ADG-V standard 267-foot taxiway-to-taxiway separation by moving Taxiway B, 16 feet further from Taxiway A.

This alternative was rejected because it would not only result in encroachment of the service roads that parallel Taxiways M and T but would also result in major construction costs and operational disruptions resulting from the relocation of Taxiway B.

[18] FAA Air Traffic Order 7110.65C

8. RUNWAY 4R RSA

As depicted on the Existing ALP, the localizer, service road and airport property fence are located within the Runway 4R and Runway 22L Runway Safety Areas (RSA).

8.1 PROPOSED MOS

There are no current or future plans to either widen or lengthen Runway 4R-22L. Based on detailed analyses determined through an RSA Practicability Study and based on FAA correspondence of November 15, 2004[19] it is requested that the runway localizers, service roads and property fence remain in their existing locations.

8.2 ALTERNATIVES

Per FAA Order 5200.8 *Runway Safety Area Program,* an assessment was performed for a series of alternatives that included land acquisition, relocated runway thresholds and Engineering Material Arresting Systems (EMAS) and is detailed in the *Chicago O'Hare International Airport Runway 4R-22L Safety Area Practicability Study* provided to the FAA on May 4, 2004. **(**See **Appendix D)**.

[19] FAA AERONAUTICAL STUDY 2003-AGL-0878-NRA, February 14, 2005 Ref. No. A-24) *"As Runways 4R/22L and 4L/22R are existing runways (and not proposed to be modified) that are landlocked by major surface streets. It is neither practical nor prudent to relocate LOC antennas. Therefore, no remedial action is required in this area. However, the FAA recommends re-evaluating this area in the future if changes are proposed to these runways."*

9. RUNWAY 22L RSA

As depicted on the Existing ALP, the localizer, service road and airport property fence are located within the Runway 4R and Runway 22L Runway Safety Areas (RSA).

9.1 PROPOSED MOS

There are no current or future plans to either widen or lengthen Runway 4R-22L. Based on detailed analyses determined through an RSA Practicability Study and based on FAA correspondence of November 15, 2004[20] it is requested that the runway localizers, service roads and property fence remain in their existing locations.

9.2 ALTERNATIVES

Per FAA Order 5200.8 *Runway Safety Area Program,* an assessment was performed for a series of alternatives that included land acquisition, relocated runway thresholds and Engineering Material Arresting Systems (EMAS) and is detailed in the *Chicago O'Hare International Airport Runway 4R-22L Safety Area Practicability Study* provided to the FAA on May 4, 2004 **(**See **Appendix D)**.

[20] FAA AERONAUTICAL STUDY 2003-AGL-0878-NRA, February 14, 2005 Ref. No. A-24) *"As Runways 4R/22L and 4L/22R are existing runways (and not proposed to be modified) that are landlocked by major surface streets. It is neither practical nor prudent to relocate LOC antennas. Therefore, no remedial action is required in this area. However, the FAA recommends re-evaluating this area in the future if changes are proposed to these runways."*

APPENDIX A

United States Standards for Terminal Instrument Procedures
TERPS Instruction Letter (TIL) 00-005A

U.S. Department of Transporation
Federal Aviation Administration

Memorandum

Subject: **ACTION:** TIL00-005A, Interim Category II/III Obstruction Clearance Criteria

Date: September 18, 2000

From: Manager, Flight Procedure Standards Branch, AFS-420

Reply to Attn. of:

To: Manager, National Flight Procedures Office, AVN-100

The attached document is a revision to the interim Category II/III obstruction clearance criteria. Paragraphs addressing lowest minimums based on runway-taxiway separation and aircraft height-group are added. The dimensions of the missed approach areas are corrected.

This memorandum cancels TIL00-005, CAT II/III TERPS Criteria, dated February 11.

The point of contact for these criteria is Jack Corman, AFS-420, (405) 954-0012. This TIL expires concurrently with the implementation of TERPS Change 20.

Donald P. Pate

Attachment

cc: Regional AWO's
AFFSA/XOI
ATAS-AI
ATC QA
AMA-210
AVN-22A
Bill Hammett
AFS-200/400/410/420/800

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CATEGORY (CAT) II AND III
PRECISION MINIMUMS REQUIREMENTS

1.0 GROUND EQUIPMENT.

Instrument Landing System (ILS), Microwave Landing System (MLS), and Global Navigation Satellite System (GNSS) Landing System (GLS) characteristics, including facility classifications, are specified in the following publications: AC 120-29, Criteria for Approving CAT I and II Landing Minima for FAR 121 Operators; and AC 120-28, Criteria for Approval of CAT III Weather Minima for Takeoff, Landing and Roll-out, for ILS, MLS, or GLS. AC 120-28 refers to use of International Civil Aviation Organization (ICAO) Annex 10 criteria, Order 6750.24, Instrument Landing System (ILS) and Ancillary Electronic Component Configuration & Performance Requirements, and the applicable NAVAID classification for CAT III operations. NAVAID use is predicated on applicable ILS, MLS, or GLS performance classifications; e.g., ILS III/E/2, GLS II/D/2, or equivalent classification at non-U.S. facilities. For GLS, an appropriate equivalent performance classification to ILS, as specified by FAA or the ICAO, may also be used; e.g., Performance Level/Coverage/Integrity as in “II/T/1”.

2.0 LIGHTING FACILITIES.

Exceptions to lighting criteria may be authorized only if an equivalent level of safety can be demonstrated by an alternate means. Examples of exceptions are: substitution for required approach lighting components due to an approved specific aircraft system providing equivalent information or performance (such as radar based electronic voice switching system (EVS)), or computed runway centerline information which has redundant high integrity, displayed on a heads-up display (HUD), etc.

2.1 CAT II/III LIGHTING REQUIREMENTS.

CAT II or III operations require the four lighting systems below:

2.1.1 **United States (U.S.) standard** ALSF-1 or ALSF-2 approach lights;

2.1.2 **U.S. standard** touchdown zone lights;

2.1.3 **U.S. standard** runway centerline lights, and

2.1.4 **U.S. standard** high intensity runway lights.

2.2 ADDITIONAL CAT III OPERATION REQUIREMENTS.

An FAA approved plan per AC 120-57, Surface Movement Guidance and Control System (SMGCS), is required for operations below 1200 RVR.

3.0 MARKING AND SIGNS.

Airports approved for CAT II/III operations must include the following runway and taxiway markings and airport surface signs, or ICAO equivalent, unless approved by AFS-400 (e.g., for Non-United States airports). Markings and signs must be in a serviceable condition as determined by the airport authority (in the United States, normally monitored by FAA Airport Certification Inspectors). Aircraft operators or any FAA personnel (aviation safety inspectors, etc.) should report deteriorated or unserviceable markings or signs to the airport authority. At non-United States airports, any unsafe or unserviceable situations should immediately be brought to the attention of the U.S. carriers and the appropriate Certificate Holding District Office (CHDO). Other guidance, such as Order 6750.24, OpSpecs, and an approved SMGCS plan, may permit operational contingencies or exceptions. Examples of these actions are: snow removal, rubber deposit removal on runway touchdown zone markings or centerline markings, critical area hold line or runway centerline marking repainting, runway hold line sign snow removal, etc.

3.1 CAT II/III OPERATIONS REQUIRE THE FOLLOWING:

3.1.1 **U.S. standard precision instrument runway markings and signs.**

3.1.2 **U.S. standard taxiway edge and centerline markings**.

3.1.3 **Runway signs,** taxiway signs, hold line signs, taxiway reference point markings (if required by SMGCS), and NAVAID ILS critical area signs and markings.

3.1.4 **ILS/MLS Critical Area Signs and Markings.** See FAA Order 6750.16, Siting Criteria for Instrument Landing Systems, for critical area descriptions.

4.0 APPROACH MINIMUMS.

CAT II/III procedures require special authorization from the FAA. AC 120-29 (as amended) contains equipment and flight crew qualifications. Operators desiring lower than CAT I minimums, require operations specifications (OpsSpecs) authorization for air carrier operations or a Letter of Authorization (LOA) for 14 CFR Part 91 operations. Tables A1-1 lists lowest authorized minimums, but individual operators may require higher minimums. Higher minimums may also be necessary based on environmental factors in the vicinity of the airport or other Flight Standards requirements.

4.1 CAT II MINIMUMS.

Class II/T/2 facility class of performance is required for CAT II operations. The lowest CAT II height above threshold (HAT)/RVR values in feet are 100/1,200. Table A1-1 lists RVR values for HAT values greater than 100.

Table A1-1. Lowest CAT II Minimums

HAT (feet)	RVR (feet)
101-140 (1-40 adjustment)	1200*
141-180 (41-80 adjustment)	1600
181-199 (81-99 adjustment)	1800

NOTE: Chart the lowest authorized CAT II RVR
*As low as 1000 by Ops Spec

4.1.1 Adjustment of CAT II Minimums. The HAT is measured in feet from the highest elevation of the runway in the touchdown area, and runway visual range (RVR) in feet. The lowest attainable values are a HAT of 100 feet and RVR of 1,200 feet. Application of CAT II obstruction clearance criteria may identify objects that exceed the allowable height in the touchdown area or penetrate the approach light surface. In such cases, adjustment to the decision height shall be made as follows:

4.1.1 **a. Final Approach Surface.** Requires a special study of local features and conditions before CAT II operations can be authorized by the FAA Flight Standards Service.

4.1.1 **b. Approach Light Surface and Touchdown Area.** Adjust the decision height (DH) upward one-foot for each foot an object exceeds the allowable height. The RVR value will then be adjusted as indicated in table A1-1.

4.1.1 **c. Minimum HAT Value.** The minimum HAT value for CAT II operations is 100 feet where the runway centerline to taxiway centerline separation is 600 feet or greater. This value may be also be achieved with:

4.1.1 **c. (1) Runway taxiway centerline separation of 500 feet** at elevations of 4,000 feet and below, provided taxi operations are restricted to aircraft with wingspans less than 214 feet and tail heights less than 66 feet.

4.1.1 **c. (2) Runway taxiway centerline separation of 400 feet** at elevations of 4,000 feet and below, provided taxi operations are restricted to aircraft with wingspans less than 171 feet and tail heights less than 55 feet.

4.1.1 **c. (3) Larger aircraft flying the approach or taxiing** on parallel taxiways, or taxiway/runway separation less than stated above require a collision risk analysis to determine the minimum HAT value.

4.2 CAT II/III MINIMUMS.

Publish the lowest authorized CAT III RVR when the runway supports unrestricted CAT I and II operations. When CAT I or II operations for a runway are restricted, CAT III minimums for the runway must be determined by a collision risk analysis. The following is the minimum class of performance (AC 120-29, appendix 2) required for an ILS to support a published FAR Part 97 CAT II or III, Standard Instrument Approach Procedure (SIAP):

4.2.1 Class III/D/3. Required for Cat III operations with visibility ≥ RVR 600.

NOTE: CAT III procedures with facility class III-D3 performance require the notation "Localizer not suitable for Electronic Rollout Guidance."

4.2.2 Class III/E/3. Required for CAT III operations with visibility ≥ RVR 600.

4.2.3 Class III/E/4. Required for CAT III operations with visibility < RVR 600.

5.0 FINAL APPROACH SEGMENT.

Develop the final approach segment under TERPS Volume 3, Chapter 3 criteria, with the following exceptions:

5.0.1 Final Approach Course Alignment. The final course alignment must be coincident with the runway centerline.

5.0.2 Final Segment Obstacle Clearance Surface (OCS) Penetrations. Penetrations of the primary (W, X) surfaces are not authorized. Taxiing aircraft are obstructions in the final segment analysis. If the "W" or "X" surface is penetrated by a taxiing aircraft (tail height), request a collision risk analysis and approval from the Flight Procedure Standards Branch, AFS-420, P.O. Box 25082, Oklahoma City, Oklahoma, 73125.

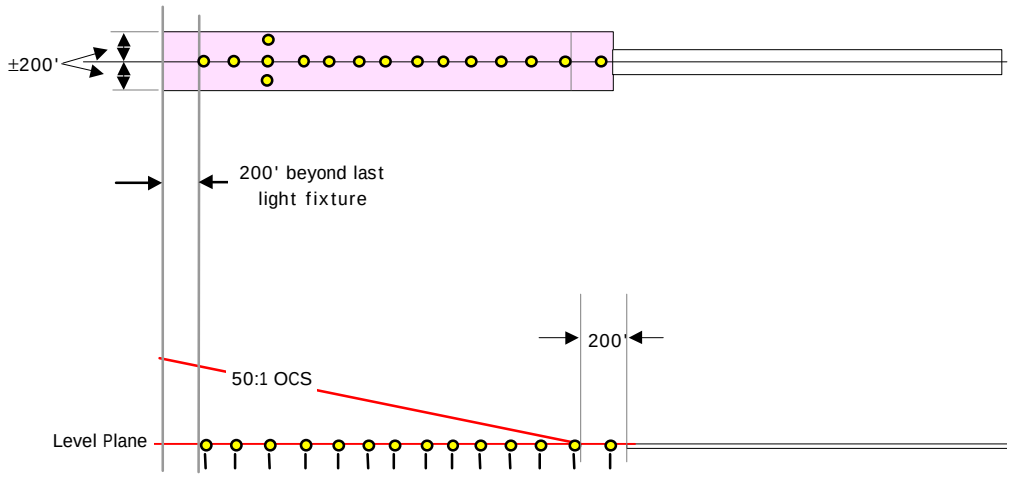
5.1 OBSTRUCTION ASSESSMENT.

Evaluate the final segment under chapter 3 of this TERPS volume. If DH adjustments are required for obstruction penetrations in the "Y" surface, adjust the HAT upward one foot for each foot the penetration exceeds the allowable height.

5.2 APPROACH LIGHT AREA.

Airports Division is responsible for maintaining obstruction requirements in AC 150/5300-13, Airport Design. Obstructions shall not penetrate the approach light area (level plane and 50:1 OCS)(see figure A1-2). The clearance required above interstate highways is 17 feet, for railroads 23 feet, and for all other roads, highways, and vehicle parking areas 15 feet.

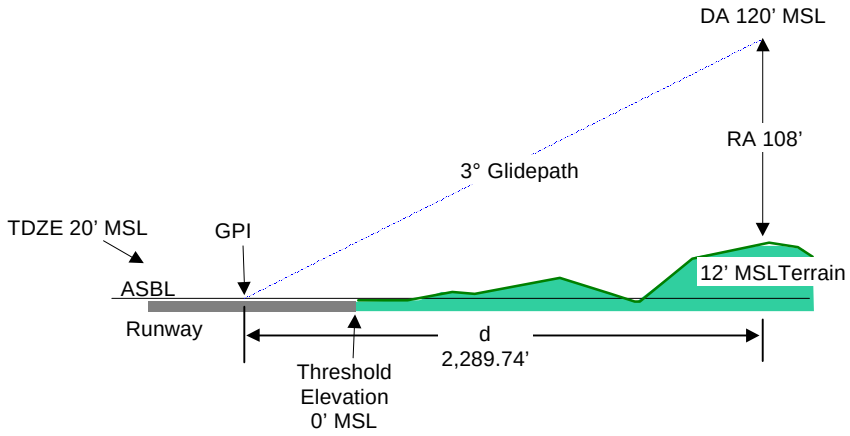
Figure A1-2. Inner Approach OFZ
Approach Light Area



5.3 CALCULATION OF RADIO ALTIMETER (RA) HEIGHT.

To determine RA height, determine the distance (d) from ground point of intercept (GPI) to the point decision altitude (DA) occurs. Obtain the terrain elevation d feet from GPI on the runway centerline extended. Subtract the terrain elevation from the DA to calculate the RA (see figure A1-3).

Figure A1-3. Calculating RA



$$d = \frac{DA - Threshold\ Elev}{Tan(GPA)} \qquad d = \frac{120 - 0}{Tan\ 3°} \qquad d = 2{,}289.74'$$

$$RA = DA - Terrain\ Elev \qquad RA = 120 - 12 \qquad RA = 108$$

6.0 MISSED APPROACH OBSTRUCTION EVALUATION FOR CAT II AND III AUTHORIZATION.

Section 1 of the missed approach segment is significantly different from the CAT I precision standard. The CAT II/III Section 1 begins at the end of the final OCS trapezoid, is aligned with the final approach course, and continues in the direction of landing for a distance of 1.5 NM. It is comprised of 3 subsections: Section 1A, Section 1B, and Section 1C. The section 1 OCS's should not be penetrated except by NAVAID's and ancillary facilities fixed by functional purpose.

6.0.1 Acceptable obstructions are:

6.0.1 **a. All Visual Aids on Frangible Mounts.** For approach lighting system components including visual glide slope indicators (VGSI's), the maximum height is as specified by the latest edition of Order 6850.2. For taxiway signs, the latest edition of AC 150/5340-18 specifies the maximum height.

6.0.1 **b. ILS glide slope antenna** or monitor masts and automated surface observing system (ASOS) wind sensor towers, which are permitted to exceed 15 feet above the elevation of the points on the runway centerline abeam them.

6.0.1 **c. Glide slope shelter**, precision approach radar (PAR), RVR, and ASOS components, which shall not exceed a height of 15 feet above the elevation of the point on the runway centerline abeam them (except ASOS wind sensor towers, which may exceed 15 feet). These structures are recommended to be located at least 400 feet from runway centerline; the minimum distance is specified in AC 6750-16, , except where an RVR component must be sited less than 400 feet from runway centerline. Obstructions more than 15 feet above the runway centerline elevation may be permitted if the minimum distance from the runway centerline is increased 10 feet for each foot the structure exceeds 15 feet. Frangible PAR reflectors are not considered obstructions.

6.0.1 **d. Aircraft taxiing via a parallel** or adjacent taxiway and clear of the obstacle free zone (OFZ) (see AC 150/5300-13) MAY penetrate the CAT II/III missed approach surfaces PROVIDED the runway centerline to taxiway centerline distances and aircraft dimensions standards contained in paragraphs 4.1.1.-4.1.1c(3) are met. Perform a collision risk analysis where the airport elevation is greater than 4,000 feet MSL, where aircraft with wingspans or tail heights are greater than in the specified paragraphs, or for taxi on existing or proposed taxiways that are less than the specified distances from runway centerline. Supporting data required for completing the ICAO Collision Risk Model (CRM) analysis is contained in FAA Order 8260.4, ILS Obstacle Risk Analysis. The data includes airport elevation, largest aircraft type, estimated number of this type of aircraft that could typically be occupying the parallel taxiway during CAT II or III operations, and all obstructions relevant to a CRM analysis in the vicinity of the airport. The taxiing operation during CAT II/III operations will be approved by the Flight Standards Service. Required operational conditions and/or limitations will be specified in the approval documentation.

6.1 SECTION 1A.

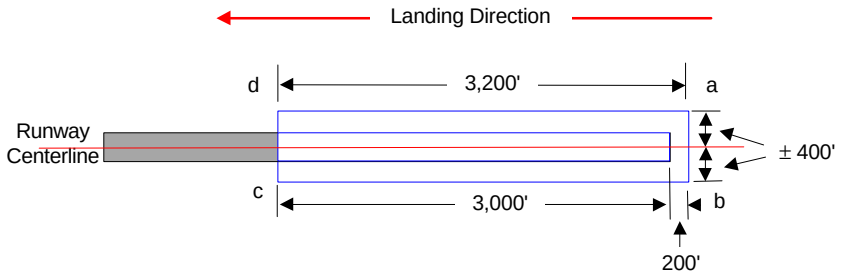
Section 1a is the touchdown area. See figure A1-4.

6.1.1 Area.

6.1.1 **a. Length.** Section 1A begins at the end of the final "W" OCS area (ab line). It extends a distance of 3,200 feet in the direction of landing to a point 3,000 feet from runway threshold (RWT) (cd line).

6.1.1 **b. Width.** Total width of the area is 800 feet (± 400' from centerline).

Figure A1-4. Section 1A. *Touchdown Area*



6.1.1 **c. OCS.** The surface elevation within this area is equal to the elevation of a point on the runway centerline perpendicular to the obstruction being evaluated. The only obstructions permitted in the touchdown area are those obstructions that are fixed by their functional purpose or those required for the approaches. Parked aircraft are not permitted within this area. This area must be free of obstruction penetrations, except for frangible visual NAVAID's that are required for CAT II and III operations. All obstructions, except visual aids and frangible functional objects, must be marked and lighted in accordance with AC 150/5340-18, Standards for Airport Sign Systems, unless shielded by a properly lighted and marked object.

6.2 SECTION 1B.

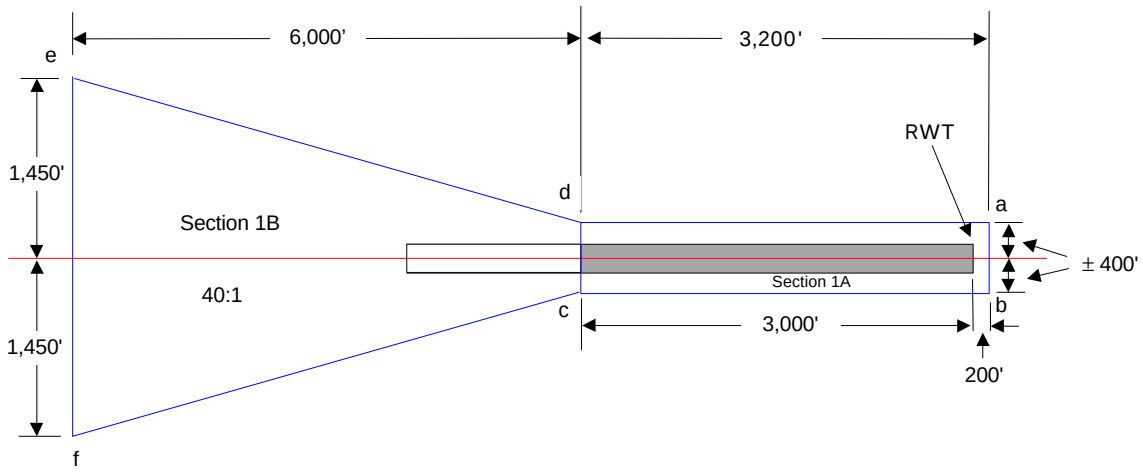
Section 1B begins along a line defining the end of section 1A (cd line) (see figure A1-5).

6.2.1 Area.

6.2.1 **a. Length.** The area extends 6,000 feet from the cd line along the runway centerline.

6.2.1 **b. Width.** The area expands from ± 400 feet at the cd line to ± 1,450 feet at the end of the section (ef line).

Figure A1-5 Section 1B



6.2.1 **c. OCS.** Section 1B is a 40:1 surface that begins at the elevation of the runway centerline 3,000 feet from the RWT, and rises to a height of 150 feet above ASBL. Evaluate obstructions using the shortest distance from the obstruction to the beginning of section 1B (cd line). This surface must be free of penetrations to approve CAT II or III operations.

6.3 SECTION 1C.

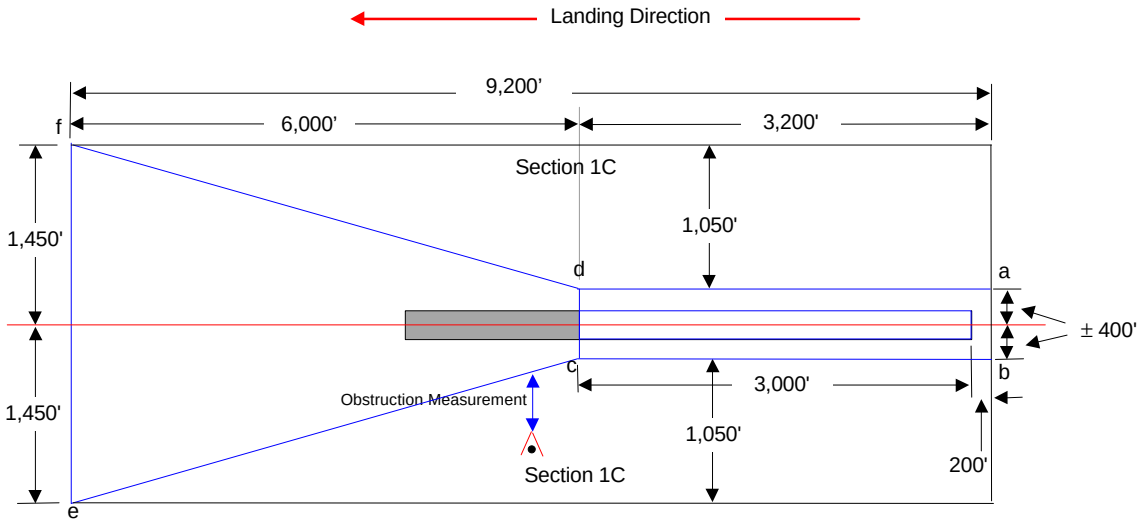
Touchdown Area Transitional Surfaces (see figure A1-6).

6.3.1 Area. Section 1C consists of two parts, one on each side of the runway adjacent to sections 1a and 1B. The areas begin at the beginning of section 1A (ab line) and extend in the direction of landing.

6.3.1 **a. Length.** The length of Section 1C is approximately 1.5 NM (9,200 feet).

6.3.1 **b. Width.** The width of the section is 1,050 feet from its beginning (ab line) to a point abeam the cd line. This width tapers from 1,050 feet abeam the cd line, to zero at the end of section 1B (ef line).

Figure A1-6. Section 1C



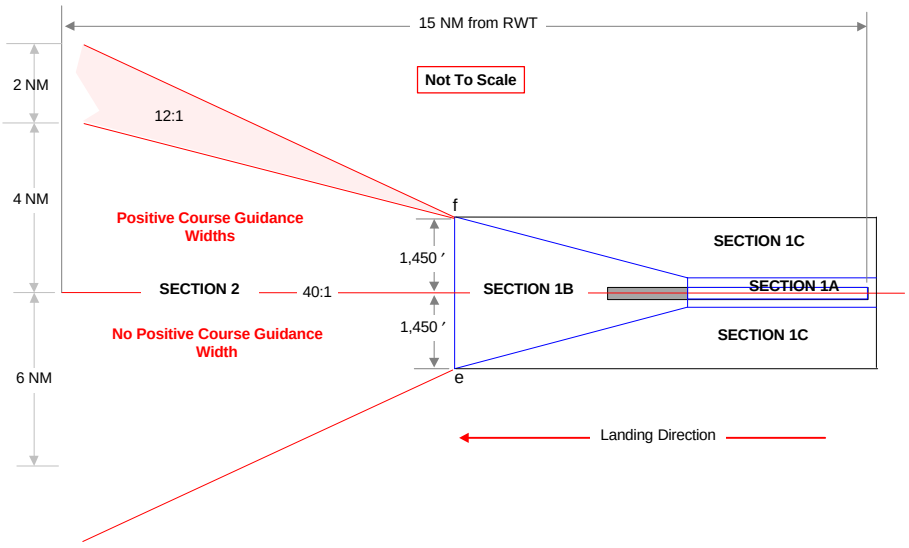
6.3.1 **c. OCS.** Section 1C is a 7:1 surface that rises perpendicular to the missed approach course from the elevation and boundary edge of section 1A or B to a height of approximately 150 feet above the ASBL. Evaluate obstructions measuring perpendicular to the missed approach course, from the outer edge of section 1A or 1B to the obstruction. The OCS should not be penetrated. A structure, such as a building or tower, which penetrates section 1C is an obstruction to CAT II/III landing operations even when the same obstruction does not penetrate the OFZ. When fixed obstructions penetrate the OCS, and when deemed necessary and approved by the Flight Standards Service, adjust RVR minimums commensurate with the degree of interference presented by the obstruction. Publish the RVR required in application of table A1-1 as if the HAT were adjusted for the penetration. Do not adjust the HAT. Add a cautionary note to the approach procedure to identify the obstruction. Parked aircraft that penetrate section 1C are considered an obstruction to CAT II/III landing operations.

6.4 **SECTION 2.** See figure A1-7.

6.4.1 **Area.**

6.4.1 **a. Straight-ahead Missed Approach Area.** This portion of the area starts at the end of section 1 and is centered on a continuation of the section 1 course. The width increases uniformly from 3,100 feet at the beginning to 12 miles at a point 15 miles from the runway threshold. When positive course guidance is provided for the missed approach procedure, secondary reduction areas which are zero miles wide at the point of beginning and increase uniformly to 2 miles wide at the end of section 2, must be added to section 2 (see figure 3-15).

Figure A1-7. Section 2, NON-RNAV



6.4.1 **b. Turning Missed Approach Area.** (Applies to turns of over 15°). See figures A1-8 and A1-9. The design of the turning missed approach area assumes that aircraft missing an approach will climb straight ahead until reaching a height of at least 300 feet above the elevation of the runway centerline at the end of the touchdown area. The procedure will identify the obstruction if a turn toward a significant obstruction has to be made. The turning flight track radius shall be 1.75 miles and it shall be plotted to begin at the end of section 1. The outer boundary of section 2 shall be drawn with a 3.5 mile radius. The inner boundary line shall commence at the outer edge of the section 1C surface opposite the end of the touchdown area. The outer and inner boundary lines shall terminate at points 4 miles each side of the assumed flight track 15 miles from the runway threshold. Where secondary areas are required, they shall commence after completion of the turn. Turns in the missed approach area are normally specified to commence after reaching a height of 300 feet. Where an operational requirement exists to continue the climb of the aircraft to a height of more than 300 feet prior to commencing a turn, section 1 will continue to increase uniformly in width, and will be extended longitudinally 4,000 feet for each 100 feet of height over 300 feet. In addition, section 1C is also extended laterally on the inside of the turn to a height equal to the elevation attained by the extension of section 1.

Figure A1-8. Turning Missed Approach Detail

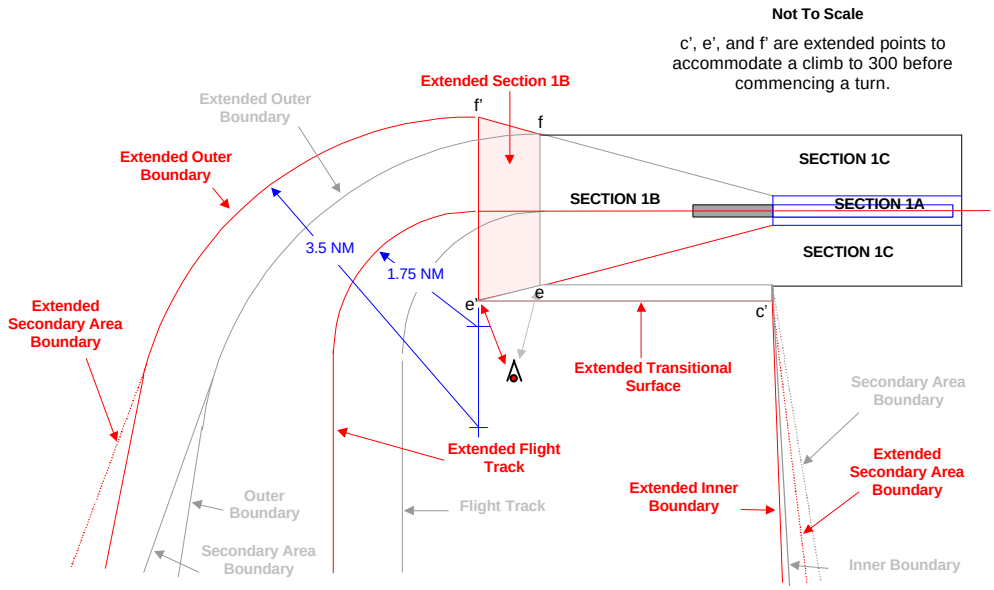
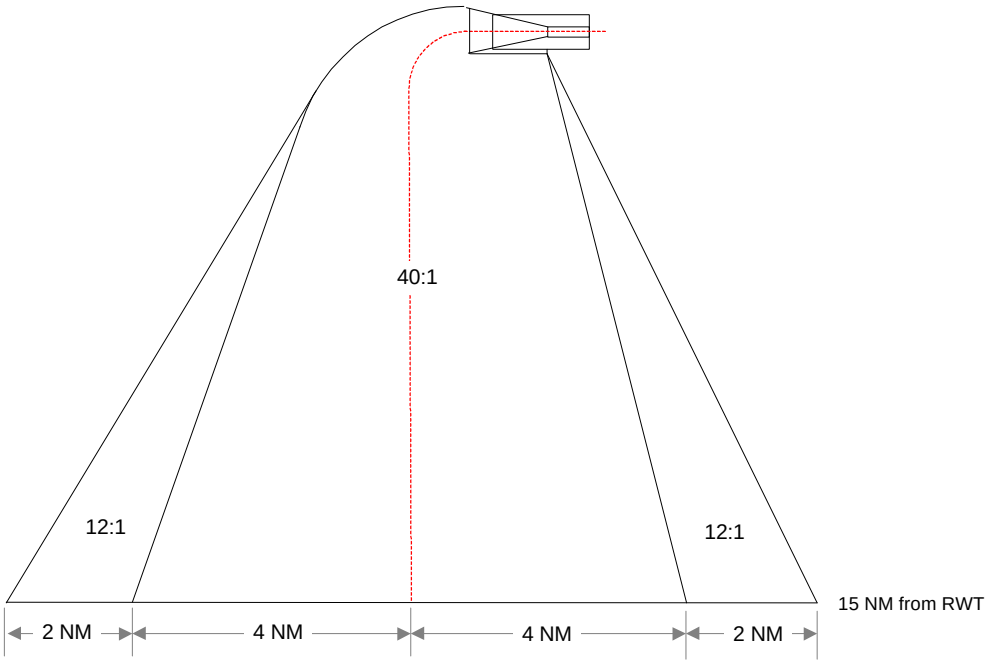


Figure A1-9. Turning Missed Approach Detail - continued



6.4.1 **c. Obstructions in the Missed Approach Area.** The 40:1 missed approach surface identifies obstructions which may be a hazard in the missed approach area. When an object penetrates the 40:1 surface, the missed approach procedure will contain a note specifying the minimum rate of climb required to clear the obstruction by the number of feet determined by the following formula:

Clearance=0.31579 x (obstruction height above DER). The climb gradient is effective until reaching a hundred-foot (3,100; 1,600; etc.) altitude from which the 40:1 surface is clear. Do not publish climb gradients less than 152 feet per NM.

Example: NOTE: **"MISSED APPROACH OBSTRUCTIONS REQUIRE A CLIMB GRADIENT OF 190 FEET/NM (315 FPM/100 KT, 470 FPM/150 KT, 630 FPM/KT) TO 3,100 FEET, NO WIND CONDITIONS**."

APPENDIX B

FAA Runway/Parallel Taxiway Separation Guidance

U. S. Department
of Transportation

**Federal Aviation
Administration**

Great Lakes Region
Illinois, Indiana, Michigan,
Minnesota, North Dakota
Ohio, South Dakota, and
Wisconsin

2300 E Devon Avenue
Des Plaines, Illinois 60018

April 8, 2004

Mr. Michael Boland
First Deputy Director
O'Hare Modernization Program
Department of Aviation
Post Office Box 66142
Chicago, Illinois 60666

Re: Runway/Parallel Taxiway Separation Guidance & Update on the Status of FAA Advisory Circular 150/5300-13; Change 8

Dear Mr. Boland:

As you are aware, the FAA has been evaluating the runway/parallel taxiway separation issues associated with the draft October 2003 Airport Layout Plan submitted by the City of Chicago. The FAA's Airport Obstruction Standards Committee (AOSC) Decision Document #1, published December 18, 2003, requires that the runway/parallel taxiway separation be 500' when aircraft are arriving and departing the runway in CAT II/III weather conditions. There are three locations on the draft ALP where the runway/parallel taxiway separation is less than this standard.

In addition, the FAA has been using Change 7 of the Advisory Circular 150/5300-13, Airport Design, in the review of the City of Chicago's draft October 2003 Airport Layout Plan (ALP). There has been concern that potential changes in this advisory circular, as referenced in Change 8 to be released later this year, could impact the ALP review process.

The purpose of this letter is to inform you of the FAA decisions regarding each of the non-standard runway/parallel taxiway situations as well as to provide guidance on the potential impact of the release of Change 8 of Advisory Circular 150/5300-13.

Runway/Parallel Taxiway Separation Standards

Proposed New North Runway 9L/27R

The City of Chicago's proposed new north runway, as depicted on the draft October 2003 ALP, has a full-length parallel taxiway. The taxiway/runway centerline separation for the western most 2,750 feet is depicted at 500', with the remaining easterly 4,750' depicted as 400'. This is primarily due to the location of the north detention basins. The FAA has examined a total of 7 alternatives (including the proposed draft ALP layout) to determine the most feasible solution to this runway/parallel taxiway location issue. Based on the results of this analysis, and the

proposed flow of aircraft on the taxiway network, the FAA has concluded that removing a portion of the parallel taxiway from the intersection of Runway 14L east to the first high speed runway exit preserves the operational efficiency of the airfield **(see Exhibit 1).** This alteration in the taxiway network will require the City to submit a request for a Modification to Standards.

Future Runway 9R/27L (Existing Runway 9L/27R) with Extension

The City of Chicago has proposed a 3,594 foot runway extension to the west on Future Runway 9R/27L. The runway/parallel taxiway separation between the existing runway and parallel taxiway (Taxiway H) is 367'. For the length of the runway extension, the separation is increased to 400 feet. The existing taxiway would not be relocated. However, a second parallel taxiway is located on the west end of the runway that provides a 700' runway to taxiway centerline separation. The FAA has determined that with the proposed runway/taxiway layout, as depicted on the draft October 2003 ALP, during CAT II/III conditions, Airport Design Group (ADG) V aircraft would be restricted from operating on the closest taxiway (400' spacing) and the existing Taxiway H when the runway is used for mixed operations. ADG V aircraft would be required to taxi on the second parallel taxiway whose centerline is located 700' from the runway centerline. No modification to the proposed taxiway network is required in this area.

Future Runway 10L/28R (Existing Runway 9R/27L) with Extension

The City of Chicago has proposed a 2,859 foot runway extension to the west on Future Runway 10L/28R. The runway/parallel taxiway separation between the existing runway and parallel taxiway (Taxiway M) is 500' along the entire length of the runway. Due to air traffic operational needs and forecast service road traffic volumes, a service road and an additional taxiway may be required on the east end of the runway. The FAA continues to review information provided by the City as it relates to aircraft and service vehicle movements in this area. Additional information will be provided to the City as the FAA continues with the analysis of this section of the ALP.

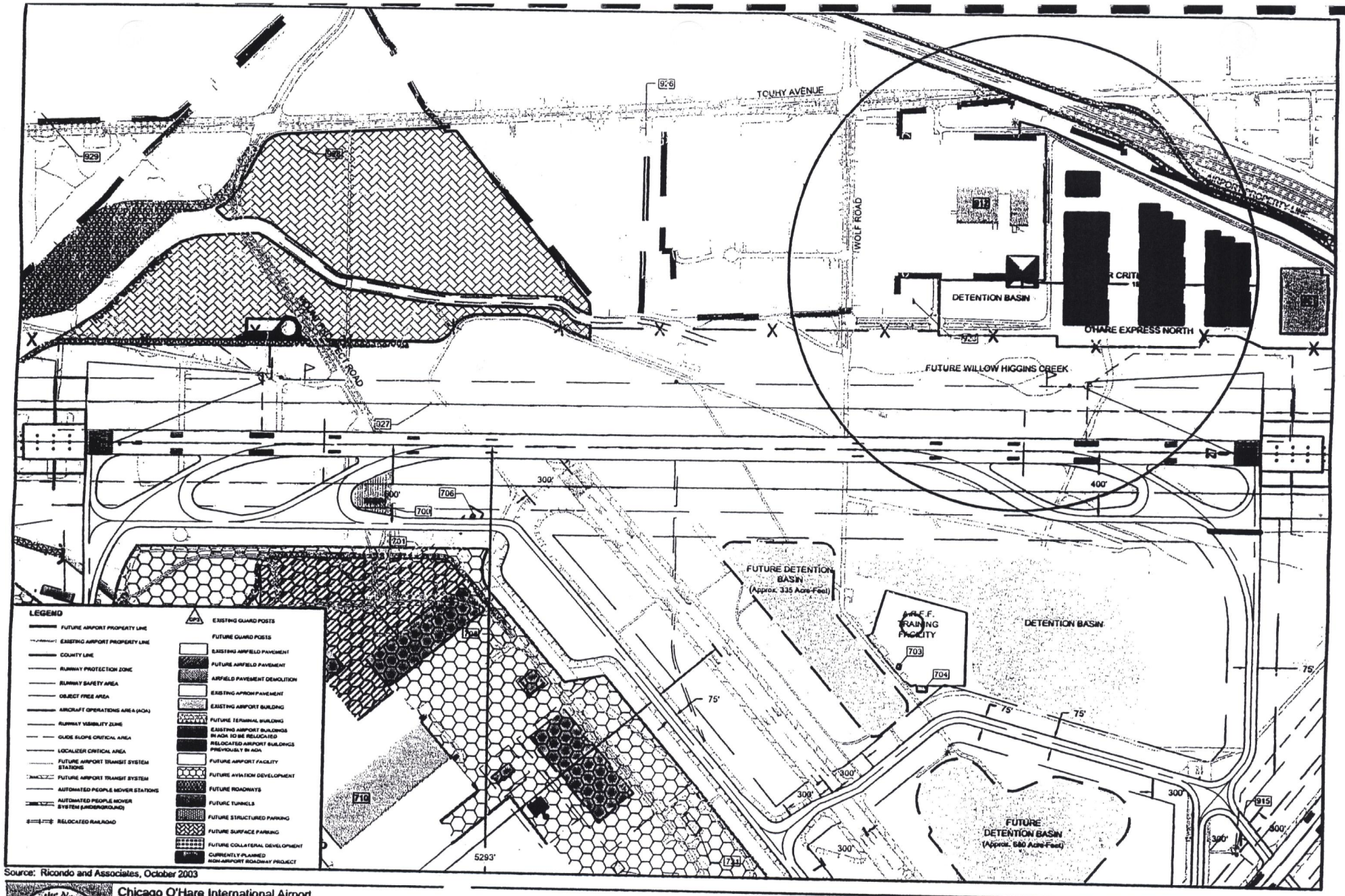
Status of Change 8, FAA Advisory Circular 150/5300-13

Currently, FAA Advisory Circular 150/5300-13, Change 7 is valid and is being used for review of the Chicago O'Hare Modernization Program ALP. Coordination with the Airports Division at the National level revealed that there are no changes with the upcoming Change 8 that would impact our review.

We are available to meet with representatives of your office to discuss the above issues. If you have any additional questions or need any information, please contact Richard Kula of my office at (847) 294-7507.

Sincerely,

Barry D. Cooper
Manager, Chicago Area Modernization Program Office



Source: Ricondo and Associates, October 2003

Chicago O'Hare International Airport
Preliminary Draft

O'Hare Modernization
Environmental Impact Statement

Runway 9L-27R Concept
Parallel Taxiway at 400 / 500 ft. Centerline Separation

Exhibit 1

D:\OHareAp\Features\Cad\Airport\2004-03-23-9L27RImpactAssessment\RWY Impact Assessment-9L-27R\2004-03-25-ORD-Future-9L-27R-Alt1-FAA-Presentation.dwg

APPENDIX C

Future Runway 9L-27R
Detention Basin Relocation Cost Estimate

4051

CTE ENGINEERS

CONSOER TOWNSEND ENVIRODYNE ENGINEERS, INC.

303 East Wacker Drive

Suite 600

Chicago, IL 60601-5276

Phone: (312) 938 0300

Fax: (312) 938 1109

May 15, 2002

Mr. Shawn Kinder
Project Manager
Ricondo & Associates
20 North Clark Street
Suite 1250
Chicago, Illinois 60602

RE: City of Chicago Airports
Civil and Environmental Engineering Services
Specification No. B890629-24
Contract No. T890629-24-02
O'Hare Modernization Plan
North Airfield – Willow-Higgins Reservoir

Dear Mr. Kinder:

Consoer Townsend Envirodyne Engineers, Inc. (CTE). is in the process of preparing existing condition plans for the North Airfield and at the same time introducing the proposed new runway and taxiway layouts. In the process of this activity, it has come to CTE's attention that the separation distance between Runway 27N and its parallel taxiway has changed since CTE was first supplied this information in 1999.

In the 1999 version, 27N and its parallel taxiway were 400 feet apart which in turn determined the design location for the Willow-Higgins Reservoir and its ancillary facilities. Under the latest plan provided to CTE in January 2002 and now carried on the Department of Aviation website, the distance between 27N and its parallel taxiway is now 600 feet. While we understand this change has been made in order to allow for high-speed turnoffs, such a change will result in significant impacts to the Willow-Higgins Reservoir and its ancillary facilities.

In as much as we have detected this impact early on in our work, CTE felt it best to advise you that the present runway/taxiway will have a 19.5 million-dollar (2001 dollars) impact on the overall program. If this runway/taxiway layout prevails, the Willow-Higgins Reservoir will have to be reshaped to accommodate the loss of 360 acre-feet of storage capacity; will require relocation and reconstruction of the creek intake spillway, and relocation and reconstruction of the pump station.

CTE ENGINEERS
CONSOER TOWNSEND ENVIRODYNE ENGINEERS, INC.

CTE recognizes why the 600-foot separation is required and desirable. However, we also believe it is important that you are aware of the impact of these changes. CTE has enclosed a copy of the reservoir, runway, taxiway layout for your information along with a preliminary estimate of cost of the impact. Further investigation will be necessary in order to determine how this work can be staged and of course reconfigured.

Should you have any questions regarding this information, please contact the undersigned.

Sincerely,

CONSOER TOWNSEND ENVIRODYNE ENGINEERS, INC. (CTE).

T. J. Parker
Associate Vice President

Enclosure

cc: P. O'Brien
J. Annett
I. Smiley
D. Hawker
File: 40511

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APPENDIX D

Chicago O'Hare International Airport
Runway 4R-22L Safety Area Practicability Study

City of Chicago
Richard M. Daley, Mayor

Department of Aviation

John A. Roberson
Commissioner

Chicago O'Hare
International Airport
P.O. Box 66142
Chicago, Illinois 60666
(773) 686-2200
(773) 601-8333 (TTY)

Chicago Midway
International Airport
5700 South Cicero Avenue
Chicago, Illinois 60638
(773) 838-0600
(773) 838-0795 (TTY)

www.flychicago.com

May 4, 2004

Mr. Tom Salaman
Federal Aviation Administration (FAA)
2300 East Devon Avenue
Suite 201
DesPlaines, IL 60018

RE: Extended Runway Safety Areas – Runway 4R-22L
Chicago O'Hare International Airport

Dear Mr. Salaman:

The following is offered in response to past requests for a "Practicability Study" assessing enhancement measures for improving the Extended Runway Safety Areas of Runway 4R-22L at Chicago O'Hare International Airport.

Runways 4R and 22L are precision instrument runways and are used as part of literally all airfield operating conditions. In terms of use, Runway 4R is used in a landing configuration 36.4 percent of the time under operating configuration Plan X, whereas Runway 22L is used in a departure configuration the remaining percentage of the time. It should additionally be noted that Runway 22L is also used for landings a small percentage of the time during heavy arrival demand periods as part of a third arrival stream in the Plan B runway-use configuration. The largest aircraft using Runway 4R-22L is the B747-400. The City has no plans to upgrade the runway to FAA Design Group VI status. Based on aircraft types using the runway, the requirements for a safety area relate to a properly graded area free of obstructions (except those fixed by function) extending 250 feet either side of the runway centerline and 1,000 feet beyond the end of the runway.

A windsock located at the 4R end of the runway originally 226 feet northwest of runway centerline, has recently been moved outside the lateral limits of the RSA. The other objects within the lateral limits of the RSA are two MALSR-27L light units fixed by function and verified to be frangible to three inches. The available extended Runway Safety Area (RSA) at the approach end of Runway 4R is illustrated on **Exhibit 1**. A review of Exhibit 1 shows the RSA is limited in length by the presence of the existing Perimeter/Service Road. The length of available RSA along the western edge is 960 feet reducing to 739 feet along the eastern edge. The length of the RSA along the runway centerline extended is 915 feet. The available RSA up to the limits imposed by the Perimeter/Service Road represents 90 percent of the area required for a standard RSA.

Recently issued guidance contained in FAA Order 5200.9 *Financial Feasibility and Equivalency of Runway Safety Area Improvements and Engineered Material Arresting Systems* places a high degree of importance on the initial 600 feet of full width RSA stating 90 percent of the overruns and undershoots can be confined to such an area for a runway such as these with vertical descent guidance. For the purposes of this assessment we have labeled this initial 600 feet of full width RSA as "Critical Area" and **Exhibit 2** illustrates such an application to the approach end of Runway 4R. A review of Exhibit 2 shows the Critical Area is more than adequately contained within the available RSA.

Considering 90 percent of the standard RSA exists at the approach end of Runway 4R, the availability of the full Critical Area to accommodate undershoots brought about by Runway 4R landings, and the more than adequate area to accommodate a roll off the end occasioned by an aborted takeoff (a far less frequent occurrence by FAA documentation) suggests the expenditure of any funds for RSA enhancement at the approach end of Runway 4R should be viewed as impractical.

The amount of full length RSA at the approach end of Runway 22L is illustrated on **Exhibit 3**. A review of Exhibit 3 shows the length of the full width RSA is limited by the Service/Snow Road with the length along the western edge extending 860 feet narrowing to 498 feet along the eastern edge. The length along the runway centerline extended is 680 feet. The amount of full width RSA up to the limits imposed by the Service/Snow Road approximates 68 percent of the area required for a standard RSA. Consistent with the methodology employed at the approach end of Runway 4R, **Exhibit 4** illustrates the availability of the 600-foot Critical Area. A review shows the full width Critical Area is essentially intact except for a small portion at the east corner brought about by the 60-foot width of the Service/Snow Road. This road is not a public use roadway and, based on the service road study performed in support of the OMP, peak hour movements are estimated to grow to only about 30 vehicles per hour. It should additionally be noted that upcoming changes to the staging areas for snow removal equipment could eliminate the need for snow removal equipment to use this roadway. When this happens, its width could be narrowed to 24 feet thus reducing the amount of infringement into the Critical Area.

Given Runway 4R departures seldom (if ever) occur and the identified Critical Area at the approach end of Runway 22L is essentially sufficient

DEPARTMENT OF AVIATION

in size to accommodate a Runway 22L landing undershoot, the issue needing to be addressed is the adequacy of the available area to accommodate a Runway 4R landing overrun. Consideration was given to the installation of EMAS at an estimated cost of $18.0M but given the availability of a nearly full Critical Area, such an expenditure of funds would seem highly impractical given its marginal benefit. Furthermore, the installation of EMAS would reduce the maximum landing weight of the B747-400 by 6,000 pounds.

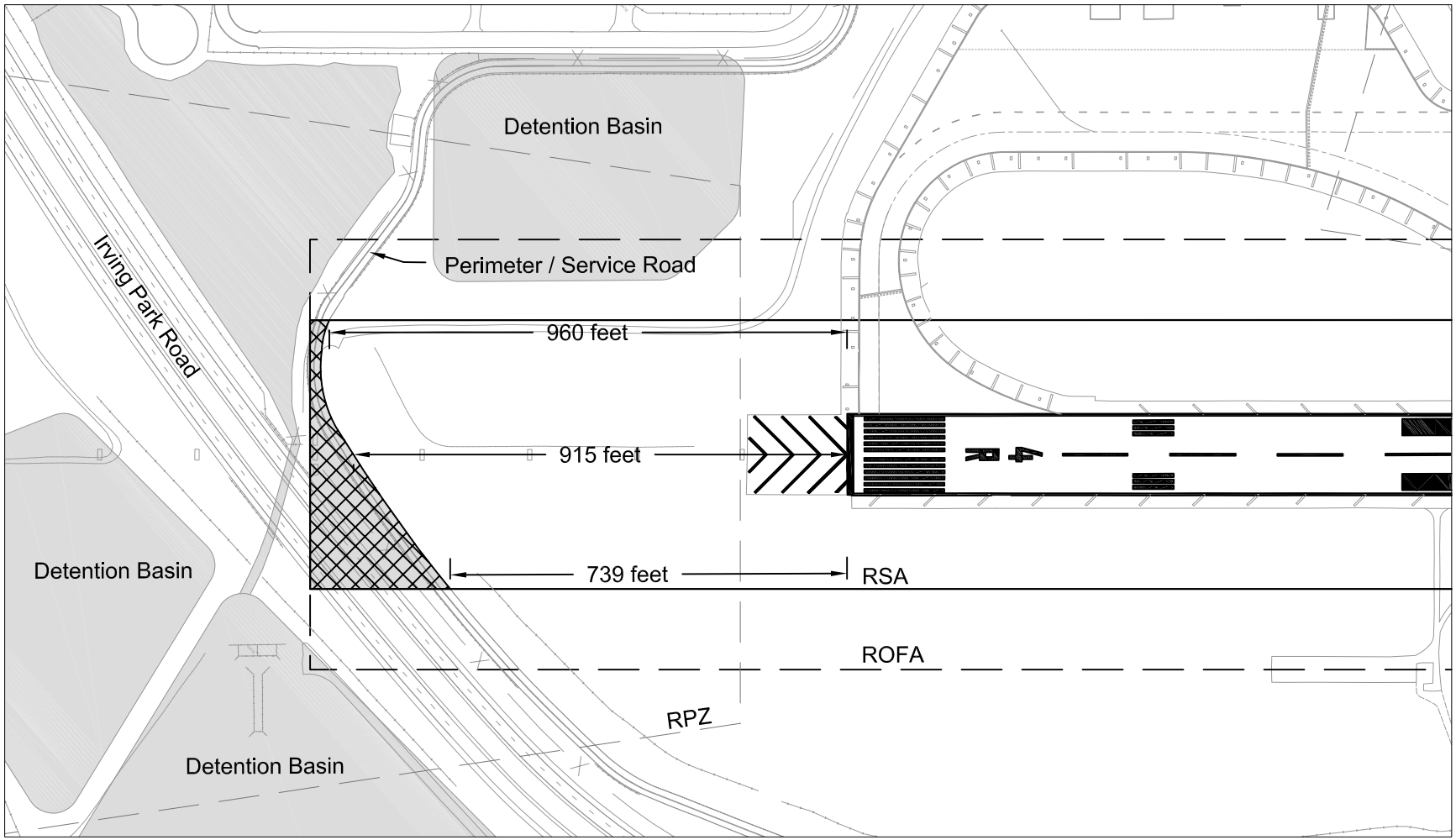
We look forward to discussing with you practicable actions following your review of this information.

Sincerely,

Kitty P. Freidheim
Managing Deputy Commissioner

Bcc: Subject File
Reading File

DEPARTMENT OF AVIATION



Source: Base Map ORD ALP, October 2003
Prepared By: Ricondo & Associates, Inc.

Exhibit 1

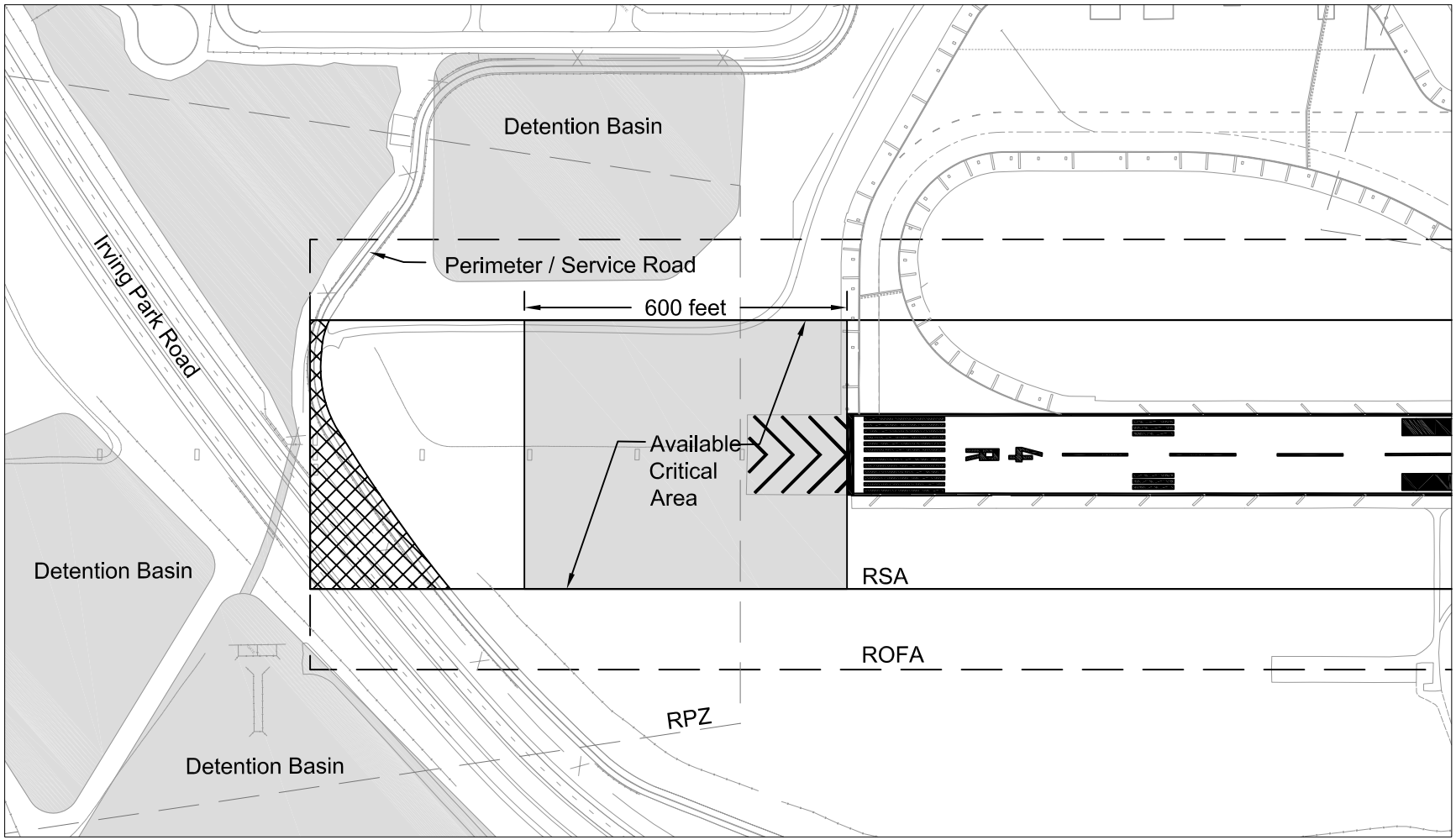
RICONDO & ASSOCIATES

0 300 feet

north

N:\CHICAGO\ORD-RSA Study (Rwy 4R-22L)\CAD\

Available Runway Safety Area
Runway 4R



Source: Base Map ORD ALP, October 2003
Prepared By: Ricondo & Associates, Inc.

Exhibit 2

RICONDO & ASSOCIATES

0 300 feet

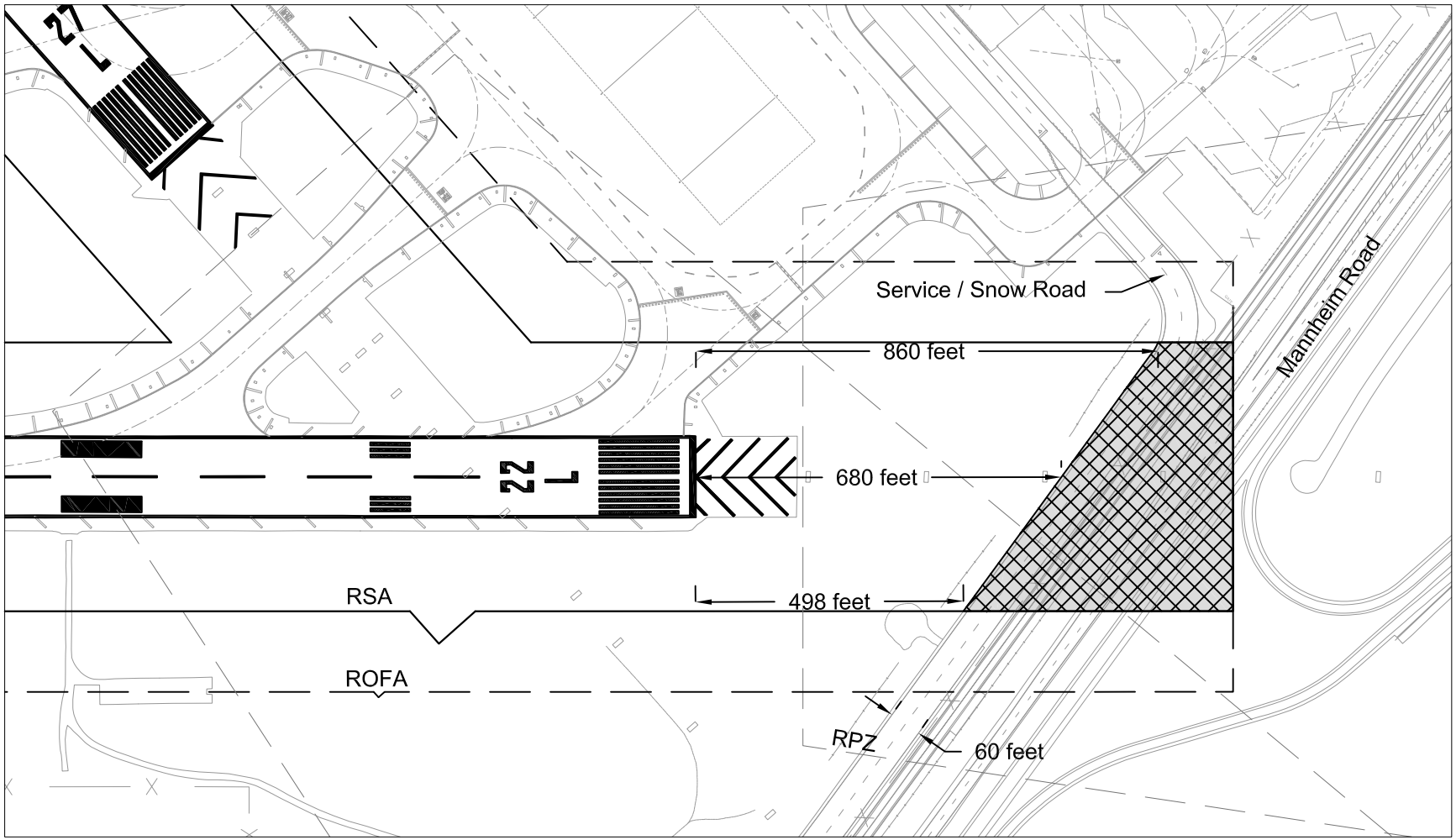
north

N:\CHICAGO\ORD-RSA Study (Rwy 4R-22L)\CAD\

Available Critical RSA
Runway 4R

Runway Safety Area Study
Runway 4R-22L

March 2004



Source: Base Map ORD ALP, October 2003
Prepared By: Ricondo & Associates, Inc.

Exhibit 3

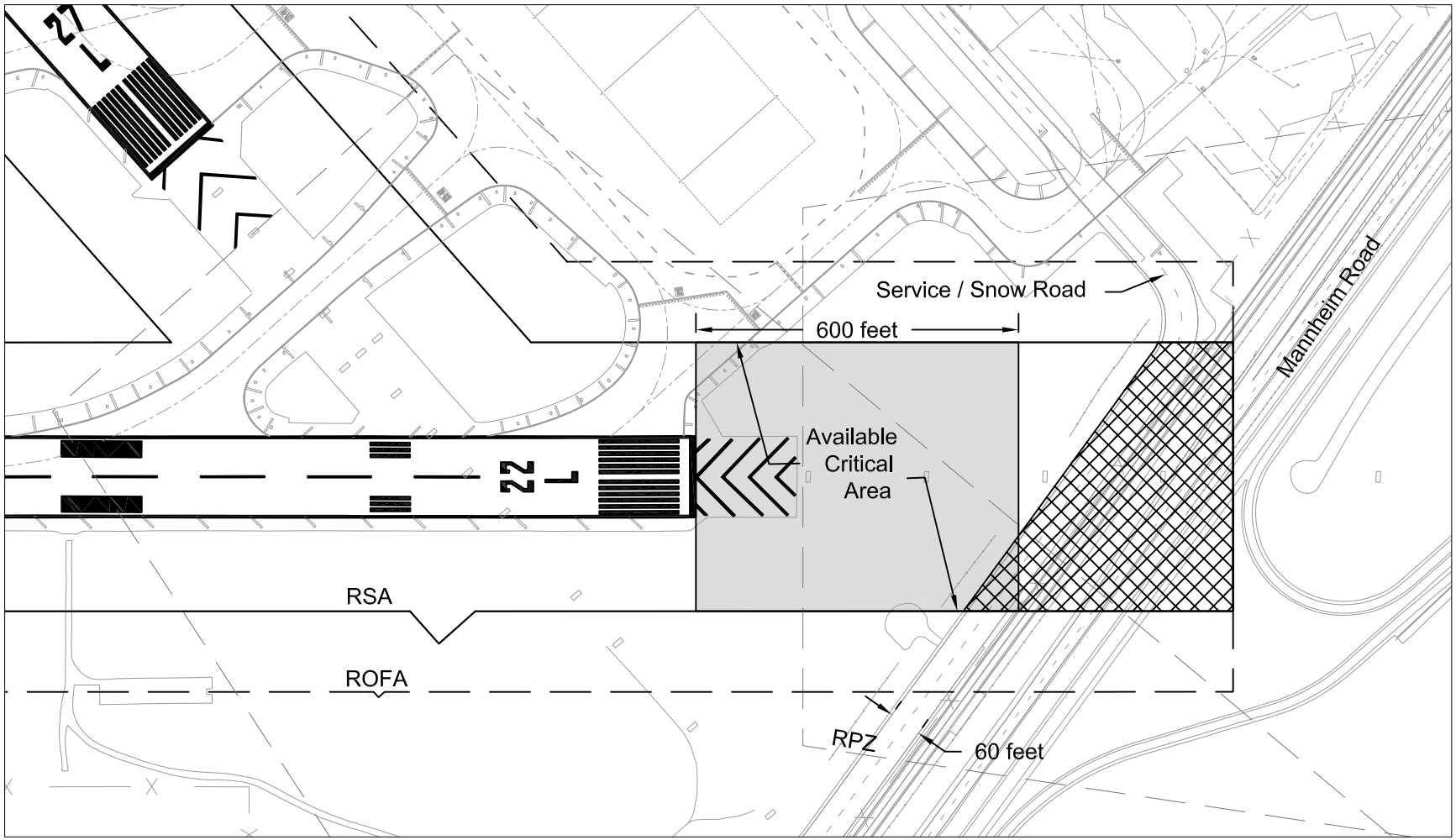
RICONDO & ASSOCIATES

0 300 feet

north

N:\CHICAGO\ORD-RSA Study (Rwy 4R-22L)\CAD\

Available Runway Safety Area
Runway 22L



Source: Base Map ORD ALP, October 2003
Prepared By: Ricondo & Associates, Inc.

Exhibit 4

0 300 feet

north

RICONDO & ASSOCIATES

N:\CHICAGO\ORD-RSA Study (Rwy 4R-22L)\CAD\

Available Critical RSA
Runway 22L

Chicago O'Hare International Airport

Runway 4R-22L Safety Area Practicability Study

Prepared for:
City of Chicago
Department of Aviation

Prepared by:
Ricondo & Associates, Inc.

May 4, 2004

Table of Contents

List of Tables

List of Figures

I. Introduction

In May of 2003 the Federal Aviation Administration (FAA) provided comments on a Draft Airport Layout Plans Package (ALP) for Chicago O'Hare International Airport. One of the comments was to conduct a practicability study for Runway Safety Area (RSA) improvement for Runway 4R-22L consistent with the requirements of FAA Order 5200.8 *Runway Safety Area Program.* The study, as presented here, is in response to the stated request.

The overall study followed the process as outlined in FAA Order 5200.8 with the initial effort of documenting the available RSA for Runway 4R-22L. The primary focus of this initial effort was thereby to document the degree to which a standard RSA, i.e., the 1,000 feet long by 500 feet wide area off the end of the runway, complies with standards in terms of grading and obstructions.

The degree to which the existing available RSA for a runway end differed from that required thereby became the focus of analyzing practicable alternatives for improvement. A series of alternatives for each runway end needing corrective action was developed.

Following the above review process, an operational evaluation of each alternative was performed based on a review of the operating characteristics of aircraft types using Runway 4R-22L and whether the subject runway end was primarily for arriving or departing aircraft. Projects having minimal adverse effects on the operation were further evaluated based on cost.

The report format follows the process as outlined above with major chapter headings of:

- Documentation of Existing Runway Safety Areas
- Runway Safety Area Enhancement Alternatives
- Evaluation of RSA Alternatives

II. Documentation of Runway 4R-22L Safety Areas

Standards for the Runway Safety Area (RSA) are found in Advisory Circular (AC) 150/5300-13, *Airport Design*. The standards can be summarized by their dimensional requirements as well as the clearing, grading and drainage requirements. An RSA is defined as "an identified surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway." The dimensional requirements of an RSA are dependent on the aircraft types accommodated by the associated runway. Both the Airplane Design Group (ADG), defined in the AC by an aircraft's wingspan, and Aircraft Approach Category (AAC) are the basis for establishing RSA dimensions. Runway 4R-22L (8,091 feet long by 150 feet wide) at Chicago O'Hare accommodates FAA Design Group V Approach Category C and D aircraft with a corresponding standard RSA dimensional width of 500 feet, centered 250 feet either side of the runway centerline, and extending 1,000 feet beyond each runway end.

Surface conditions for the RSA are additionally set forth in the AC. The FAA directive provided indicates "runway safety areas shall be cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations." Although the FAA does not provide a precise definition of these "hazardous surface conditions," it does specify grade limitations for the terrain within the RSA. Grading within the RSA must allow sufficient drainage to prevent the accumulation of water. The installation of storm sewers is permissible within the RSA, but the elevation of the inlets should not vary more than three inches from the surrounding surface elevation. Alternative methods of drainage, such as canals, creeks or rivers may be utilized in lieu of storm sewers, however, they must remain clear of the RSA boundaries. **Table 2-1** summarizes the longitudinal and transverse grade requirements for RSA areas beyond the runway end.

Table 2-1

Runway Safety Area Grade Limitations for Areas Beyond Runway End

Distance Beyond Runway End	Longitudinal Grade	Transverse Grade
Initial 200 feet	Maximum 3% No positive grade	1.5% to 5% No positive grade
Beyond 200 feet	Plus or minus 2% per 100 feet	Maximum plus or minus 5%
	Minus 5% maximum	
	No penetration of approach surface permitted	No penetration of approach surface permitted

Source: Federal Aviation Administration Advisory Circular 150/5300-13, Airport Design, September 2000.
Prepared By: Ricondo & Associates, Inc.

The FAA design standards for RSAs additionally states that the terrain "shall be capable, under dry conditions of supporting snow removal equipment, aircraft rescue and firefighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft. The RSA shall also be free of objects, except for objects that need to be located in the RSA because of their function. Objects higher than three inches above grade should be constructed on low impact resistant supports (frangible mounted structures) of the lowest practical height with the frangible point no

higher than three inches above grade. In no case should their height exceed three inches above grade."

The results of the RSA survey for Runway 4R-22L are reported in a format similar to the Runway and Object Forms contained in Appendix 1 of *FAA Order 5200.8 Runway Safety Area Program.* Objects within the RSA are thereby identified by number reference on the graphic and summarized within a table providing a name reference as well as the distance the object is offset from the runway centerline and the runway end. Additional reference is provided whether the objects location is fixed by function and if it is on frangible mounts. Areas within the RSA not meeting the required grade characteristics are also highlighted.

The primary focus of this section of the report is to document the degree to which a standard runway safety area, i.e., the 1,000 feet long by 500 feet wide area off the end of the runway, exists relative to each runway end. The degree to which the existing available RSA differs from that required thereby frames the alternatives for improvement, which are subsequently developed and evaluated later in this report.

2.1 Runway 4R-22L Data Sheet

Exhibit 1 contains runway safety area data sheet information for Runway 4R-22L. The identified objects are the same as those in FAA's Runway Safety Area Determination letter to the City dated October 5, 2000, except locations were verified and in some cases changed using the latest aerial photography and survey information.

A review of Exhibit 1 shows three (3) objects are within the lateral limits of the RSA whereas there are numerous objects within the longitudinal limits of the standard RSA related to each runway end. Within the lateral limits, the windsock (Object 11) is located within the RSA. MALSR-27L light units (Objects 24 and 25) are within the RSA, but fixed by purpose or function and are verified to be frangible to three inches.

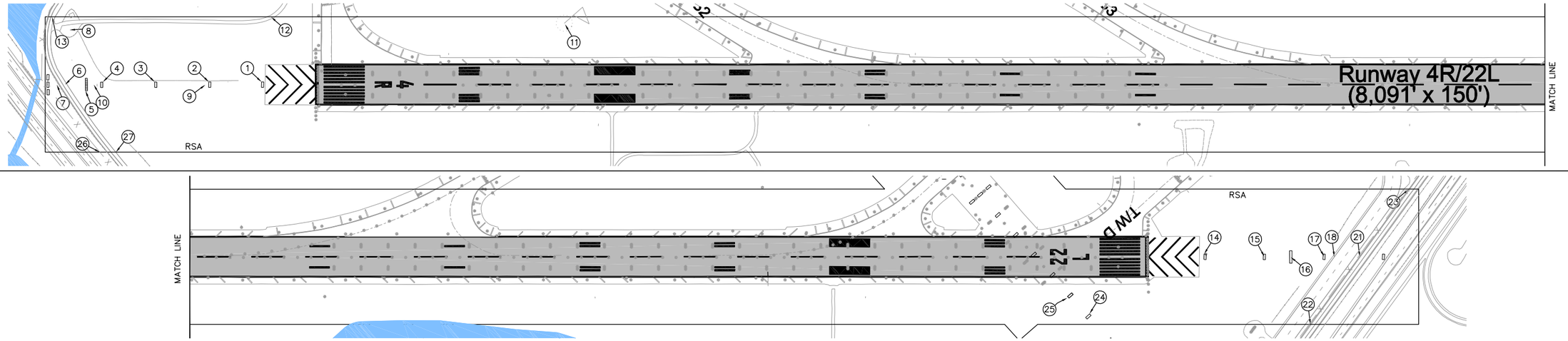
Within the extended RSA limits there are numerous objects identified within the approach areas. At the approach end of Runway 4R the majority of objects are identified as having FAA ownership with the only exceptions being the identified roads and the Airport fence. However, it should be noted that the roadway identified as Object 12, just inside the lateral limits of the RSA, provides FAA access to the Localizer Building and on that basis it is assumed its use is either controlled or used very infrequently by authorized personnel. The approach end of Runway 22L similarly has numerous objects in the extended RSA most of which are FAA NAVAIDS with the exception of a roadway and the fence line delineating the airside.

2.2 Currently Available Runway Safety Areas

The limits of the available full width RSA at the approach end of Runway 4R is illustrated on **Exhibit 2A**. A review shows the limits of the full width RSA is controlled by the perimeter service road crossing to the south. Based on the presence of this service road, the available full-width RSA has an overall length of 739 feet, some 261 feet less than the standard 1,000 feet. **Exhibit 2B** illustrates a similar analysis for the approach end of Runway 22L. A review shows the Service / Snow Road leading northward from the Southeast Service Area limits the available full width RSA to an overall length of 498 feet, some 502 feet less than the standard 1,000 feet.

AIRPORT IDENTIFIER : ORD
ARC : D-V

Chicago O'hare International Airport



No.	Type	Name	Rwy End	Rwy End Distance	Dist. from Centerline	Fixed by Function?	Can be Relocated?	Frangible?	Frangible to 3"?	Owner	Miscellaneous
1	VNAVAID	MALSR–04R	04R	–206'	0'	TRUE	FALSE	TRUE	TRUE	FAA	
2	VNAVAID	MALSR–04R	04R	–403'	0'	TRUE	FALSE	TRUE	TRUE	FAA	
3	VNAVAID	MALSR–04R	04R	–605'	0'	TRUE	FALSE	TRUE	TRUE	FAA	
4	VNAVAID	MALSR–04R	04R	–805'	0'	TRUE	FALSE	TRUE	TRUE	FAA	
5	ENAVAID	LOCALIZER–22L	04R	–859'	0'	TRUE	FALSE	TRUE	FALSE	FAA	
6	SITE	ROAD	04R	–930'	0'	FALSE	TRUE	FALSE	FALSE	AIRPORT	
7	SITE	WOODEN GU	04R	–958'	0'	FALSE	TRUE	FALSE	FALSE	AIRPORT	
8	ENAVAID	POWER PANEL	04R	–921'	210' L	TRUE	FALSE	FALSE	FALSE	FAA	
9	SITE	MAINT BAR	04R	–408'	0'	FALSE	TRUE	TRUE	TRUE	FAA	
10	SITE	MAINT BAR	04R	–821'	0'	FALSE	TRUE	TRUE	TRUE	FAA	
11	SITE	WINDSOCK	04R	1026'	226' L	FALSE	TRUE	TRUE	TRUE	AIRPORT	
12 (a)	SITE	ROAD	04R	–165'	235' L	FALSE	TRUE	FALSE	FALSE	AIRPORT	
13	SITE	ROAD	04R	–1011'	250' L	FALSE	TRUE	FALSE	FALSE	AIRPORT	
14	VNAVAID	MALSR–22L	22L	–208'	0'	TRUE	FALSE	TRUE	TRUE	FAA	
15	VNAVAID	MALSR–22L	22L	–430'	0'	TRUE	FALSE	TRUE	TRUE	FAA	
16	ENAVAID	LOCALIZER–04R	22L	–524'	0'	FALSE	TRUE	FALSE	FALSE	FAA	
17	VNAVAID	MALSR–22L	22L	–653'	0'	TRUE	FALSE	TRUE	TRUE	FAA	
18	SITE	ROAD	22L	–685'	0'	FALSE	FALSE	FALSE	FALSE	AIRPORT	
21	SITE	FENCE	22L	–782'	0'	FALSE	TRUE	FALSE	FALSE	AIRPORT	
22 (a)	SITE	FENCE	22L	–595'	250' L	FALSE	TRUE	FALSE	FALSE	AIRPORT	
23	SITE	FENCE	22L	–825'	250' R	FALSE	TRUE	FALSE	FALSE	AIRPORT	
24	VNAVAID	MALSR–27L	22L	255'	117' L	TRUE	FALSE	TRUE	TRUE	FAA	
25	VNAVAID	MALSR–27L	22L	312'	175' L	TRUE	FALSE	TRUE	TRUE	FAA	
26 (a)	SITE	FENCE	04R	–799'	250' R	FALSE	TRUE	FALSE	FALSE	AIRPORT	
27 (a)	SITE	ROAD	04R	–739'	250' R	FALSE	TRUE	FALSE	FALSE	AIRPORT	

(a) Data reported for object vary from Chicago ADO-600 Runway Data Sheet; location verified with aerial photographs

Source: Chicago ADO-600 Runway Data Sheet; Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit 1

RICONDO & ASSOCIATES

0 400 feet

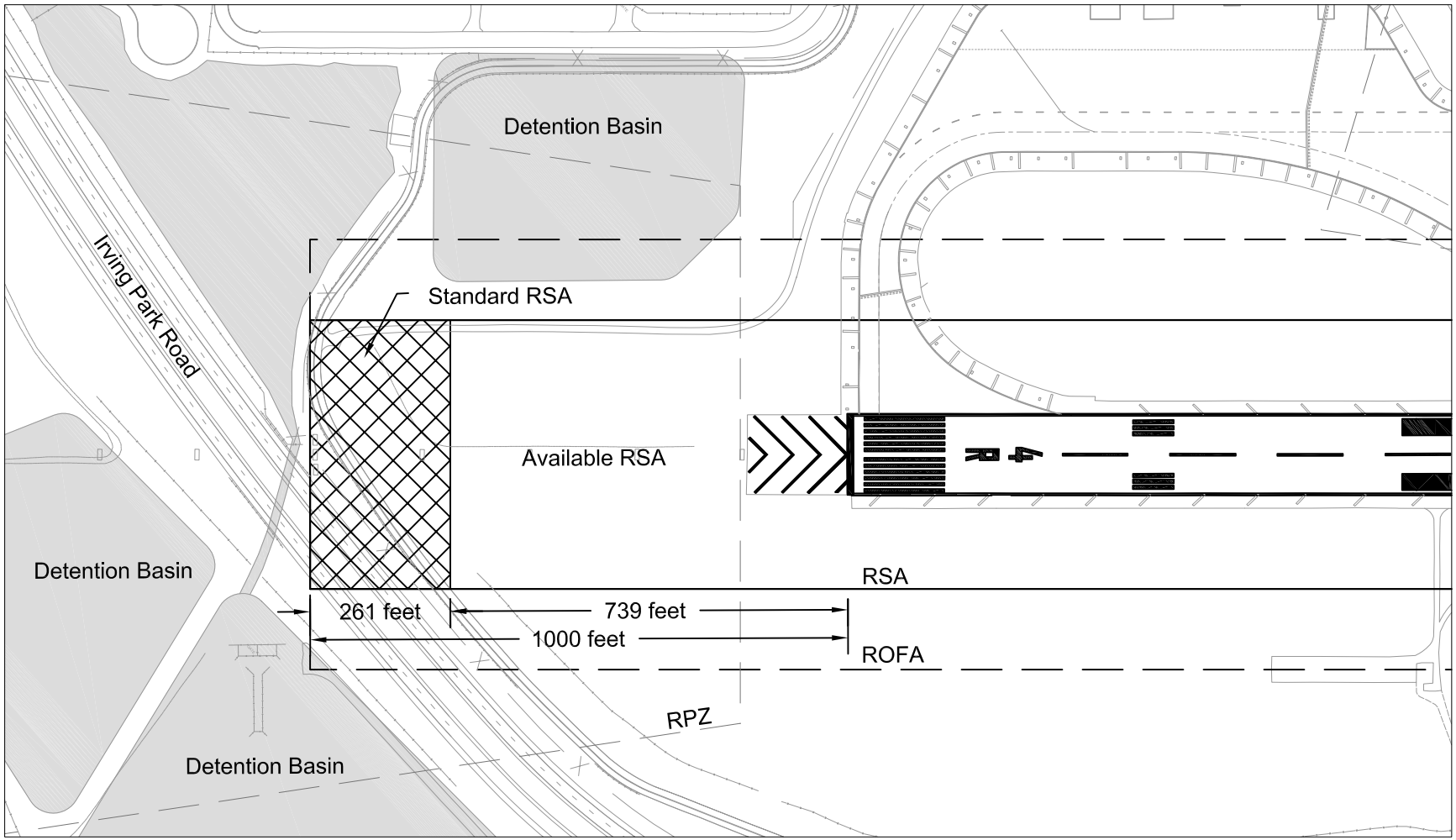
north

N:\CHICAGO\ORD-RSA Study (Rwy 4R-22L) \CAD\

Runway Safety Area Data Sheet

Runway Safety Area Study
Runway 4R-22L

April 2004



Source: Base Map ORD ALP, October 2003
Prepared By: Ricondo & Associates, Inc.

Exhibit 2A

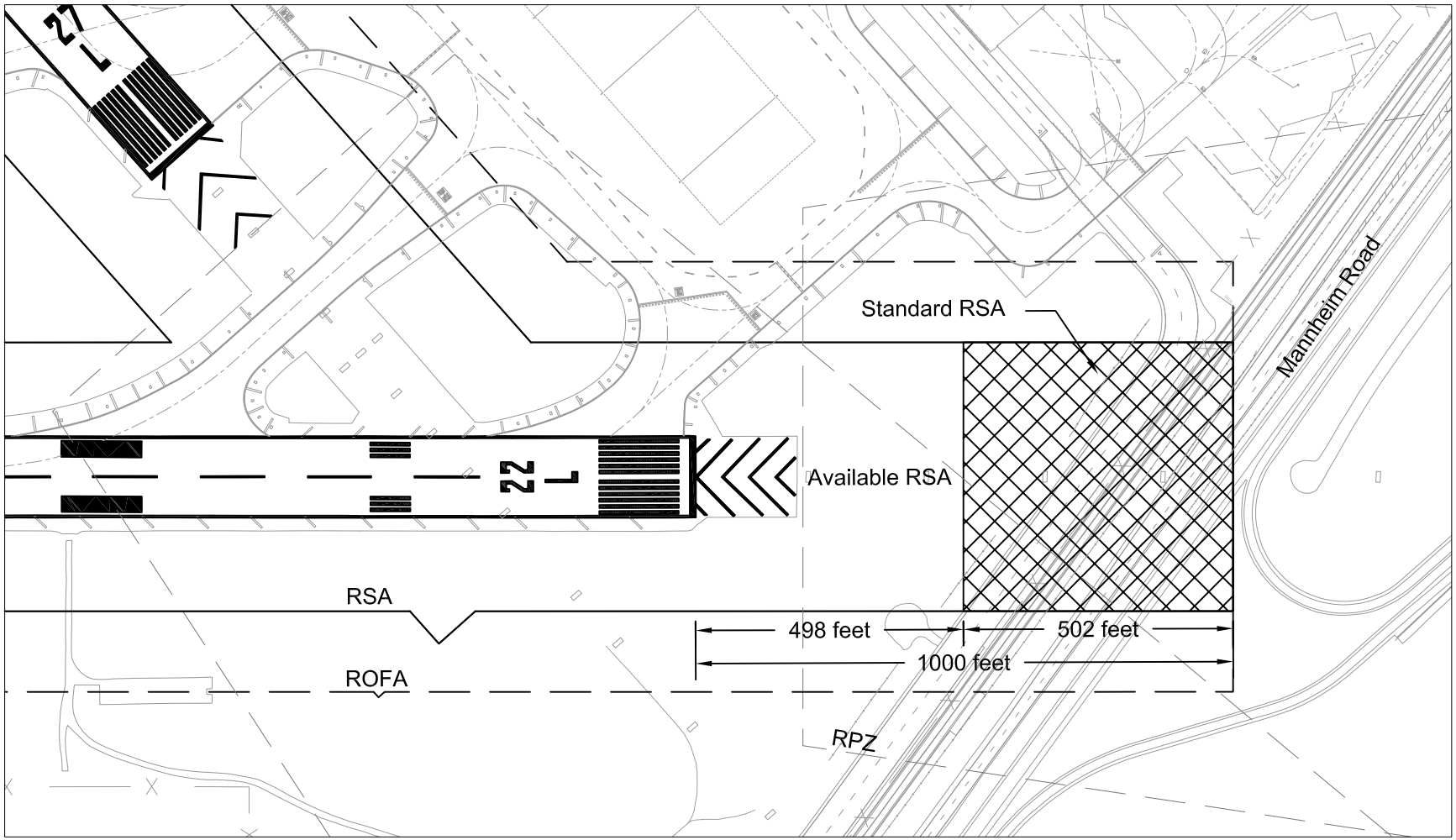
RICONDO & ASSOCIATES

0 300 feet

north

N:\CHICAGO\ORD-RSA Study (Rwy 4R-22L)\CAD\

Existing Conditions
Runway 4R



Source: Base Map ORD ALP, October 2003
Prepared By: Ricondo & Associates, Inc.

Exhibit 2B

0 300 feet

north

RICONDO & ASSOCIATES

N:\CHICAGO\ORD-RSA Study (Rwy 4R-22L)\CAD\

Existing Conditions
Runway 22L

III. Runway Safety Area Enhancement Alternatives

Under the documentation of existing runway safety area, each end of Runway 4R-22L was highlighted as having deficiency in available extended RSA. A deficiency of 261 feet was identified for the approach end of Runway 4R and 502 feet at the approach end of Runway 22L. Consistent with the process as outlined in FAA Order 5200.8 *Runway Safety Area Program,* alternatives considered to reconcile these deficiencies include the following:

- Obtain parcels of land to increase the RSA to the standard size;
- Reduce runway length where the existing length exceeds that required for use by existing or projected design aircraft;
- Use declared distances and make the associated runway lighting and marking changes; and,
- Install Engineered Materials Arresting Systems (EMAS).

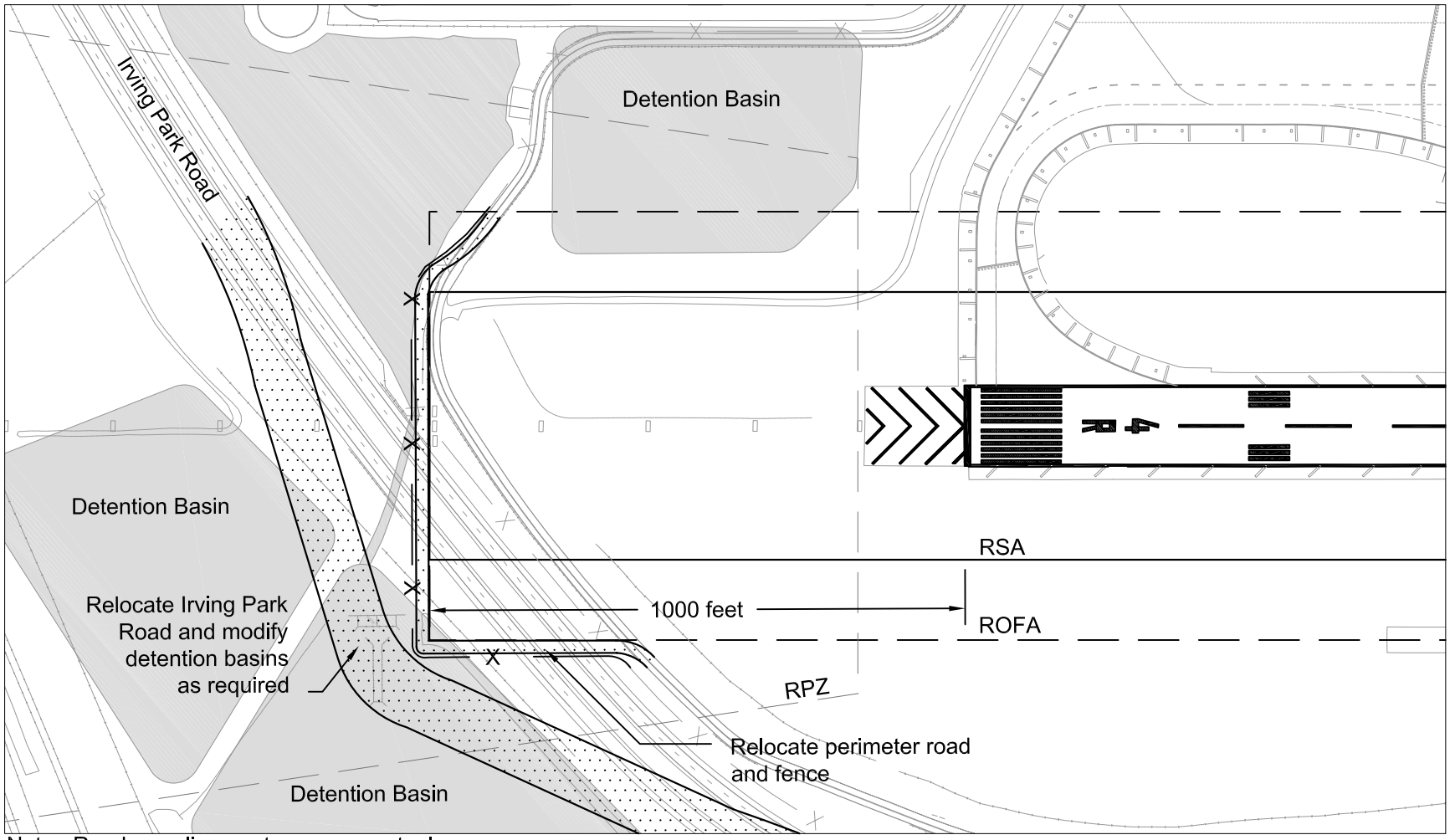
3.1 Establish Standard RSA

Acquiring additional land and making the necessary clearing and grading changes to meet RSA standards would minimize impacts to the existing runway. **Exhibit 3A** depicts the impacts to adjacent areas from providing a standard RSA at the approach end of Runway 4R. The additional 261 feet of full-width RSA would require the relocation of Irving Park Road, the Airport perimeter road, and the Airport fence. There could also be significant environmental impacts since these features would be relocated into U.S. waters, wetlands and flood plain areas. **Exhibit 3B** indicates the impacts of establishing a standard extended RSA at the approach end of Runway 22L. In order to gain an additional 502 feet of full-width RSA, Mannheim Road, adjacent connecting roads, an Airport service road, and the Airport fence would need to be relocated. It should be noted that the roadway alignments depicted in each of the exhibits are conceptual, and the actual roadway geometry would need to meet appropriate roadway design standards.

3.2 Establish Standard RSA and ROFA With Threshold Relocation

The standards as set forth in AC 150/5300-13 *Airport Design* require the Runway Obstacle Free Area (ROFA) to extend to the limits of the extended RSA. The width of the ROFA is thereby increased from that of the RSA (500 feet) to an overall width of 800 feet, with the obstacle free area beyond the limits of the RSA clear of above ground objects protruding above the runway safety area edge elevation.

To protect for a standard length RSA and obstacle free area at the approach end of Runway 4R, **Exhibit 4A** illustrates the resulting impact on the threshold location for Runway 4R. A review shows the governing obstruction is the Service Road forcing the threshold for Runway 4R to be relocated 390 feet. Under this condition, the noted 390 feet would not be available for any operation on Runway 4R-22L, with the exception of aircraft departing Runway 4R. **Exhibit 4B** represents a similar assessment, but for the Runway 22L end. A review shows that the Service / Snow Road is the governing feature at the northeast end forcing the threshold to be relocated 611 feet. As with the condition at the Runway 4R end, 611 feet of runway length would not be available for any operation except for a Runway 22L departure. The combined actions at each runway end (i.e., Exhibits 4A and 4B) would alter the landing length on Runways 4R and 22L to the center 7,090 feet available. Departure lengths would be 7,480 feet for Runway 4R and 7,701 feet for Runway 22L.



Note: Roadway alignments are conceptual

Source: Base Map ORD ALP, October 2003

Prepared By: Ricondo & Associates, Inc.

Exhibit 3A

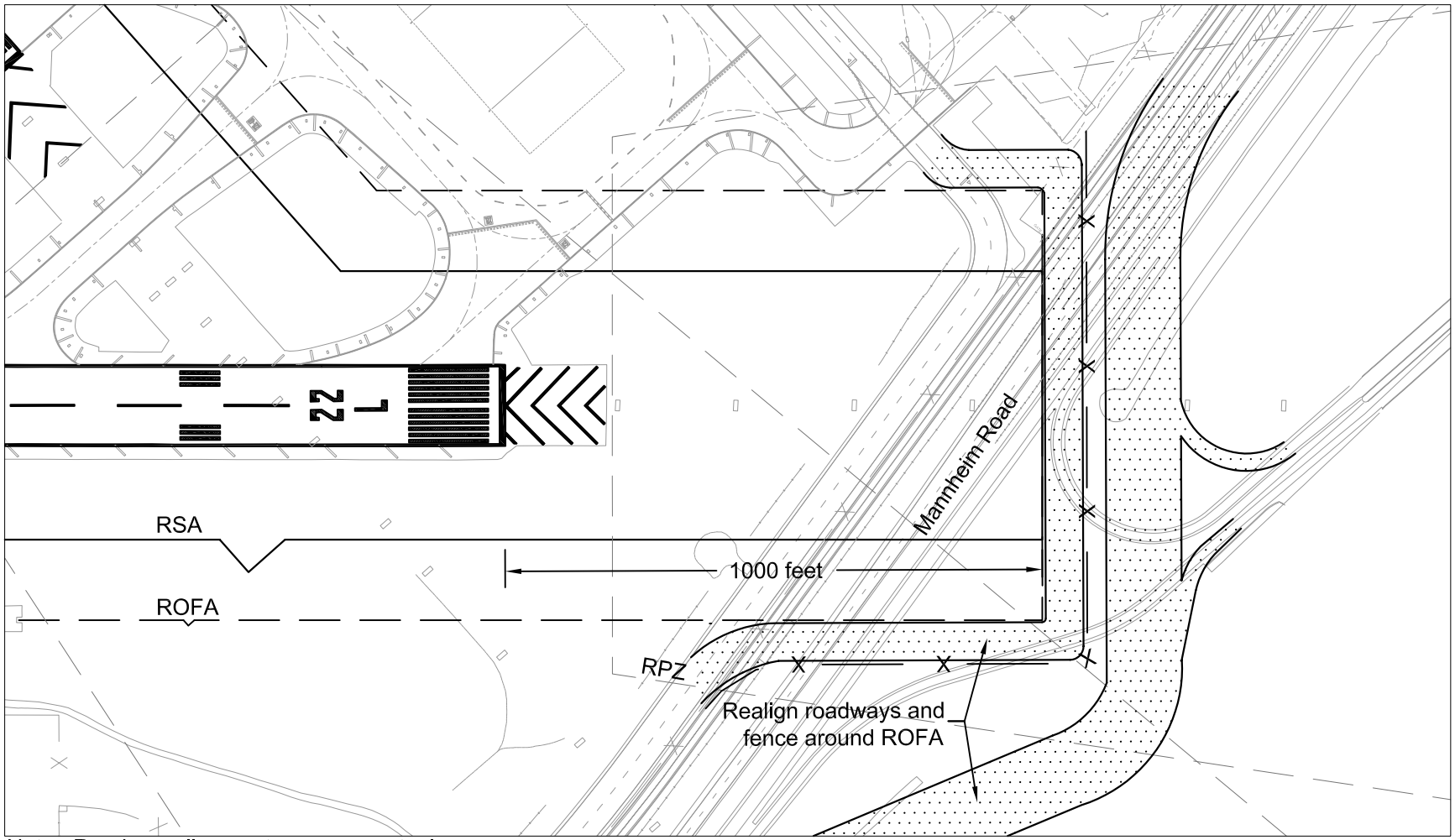
RICONDO & ASSOCIATES

0 300 feet

north

N:\CHICAGO\ORD-RSA Study (Rwy 4R-22L)\CAD\

Establish Standard RSA Runway 4R



Note: Roadway alignments are conceptual

Source: Base Map ORD ALP, October 2003

Prepared By: Ricondo & Associates, Inc.

Exhibit 3B

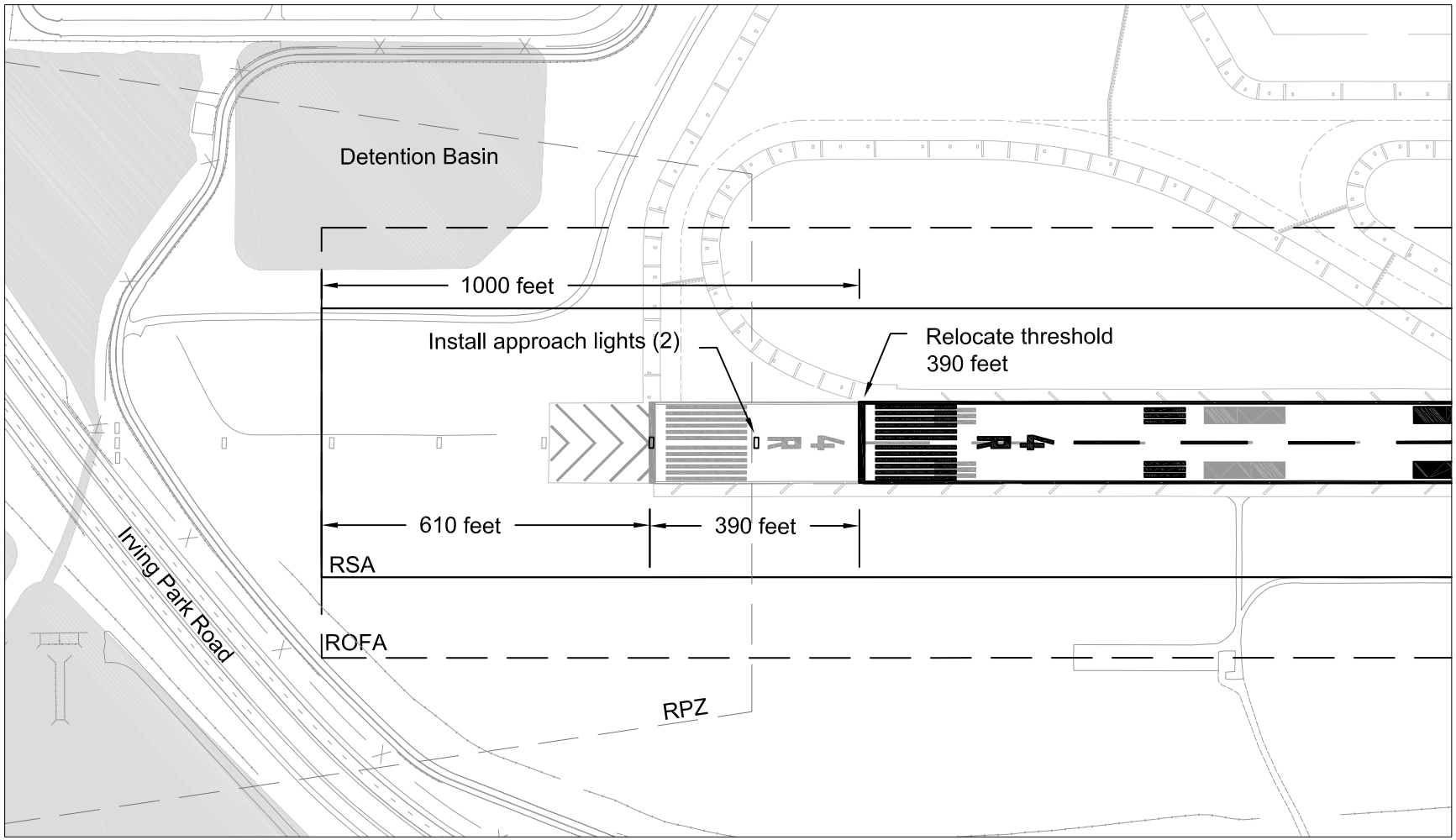
RICONDO & ASSOCIATES

0 300 feet

north

N:\CHICAGO\ORD-RSA Study (Rwy 4R-22L)\CAD\

Establish Standard RSA Runway 22L



Source: Base Map ORD ALP, October 2003
Prepared By: Ricondo & Associates, Inc.

Exhibit 4A

RICONDO & ASSOCIATES

0 300 feet

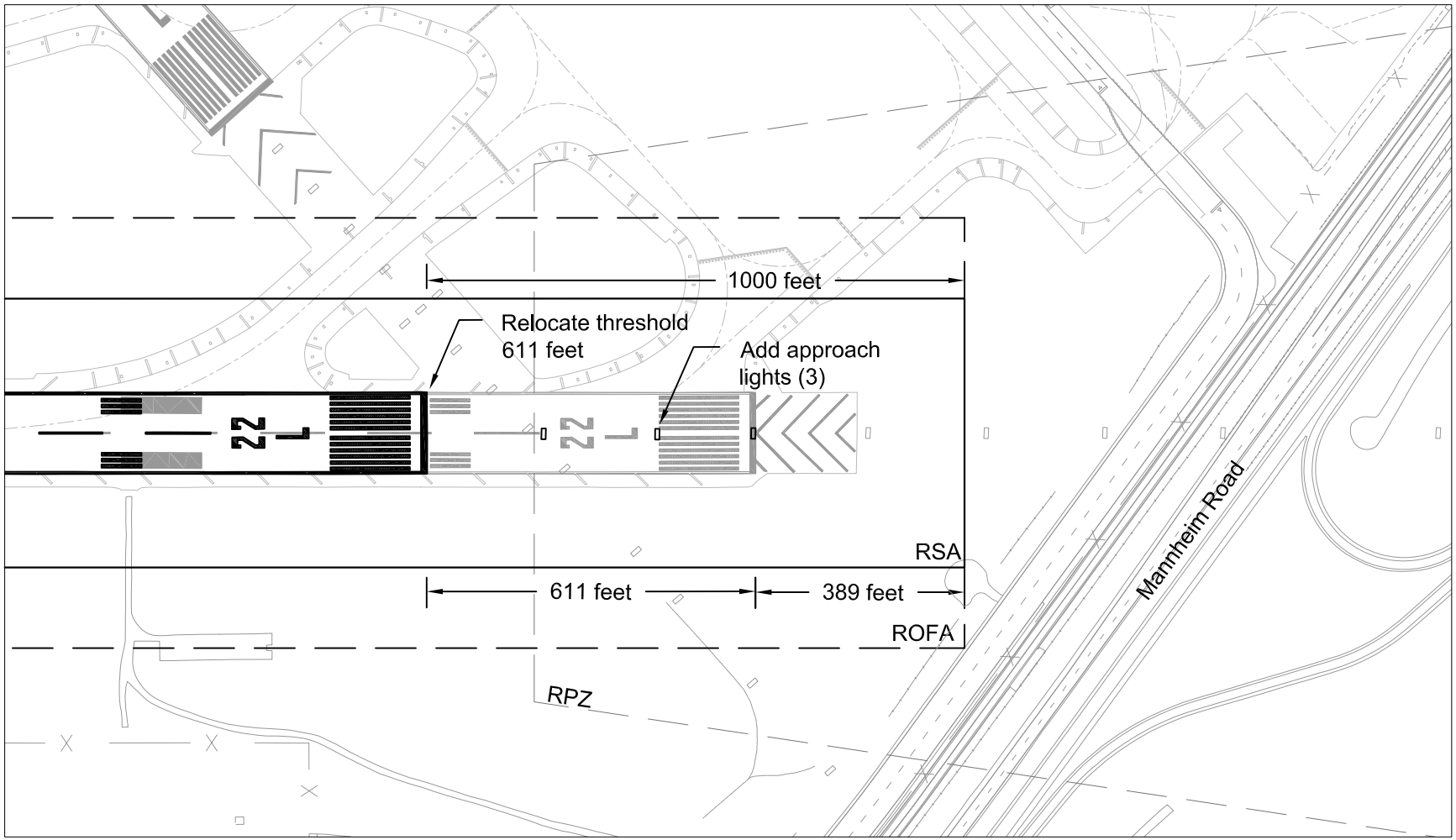
north

N:\CHICAGO\ORD-RSA Study (Rwy 4R-22L)\CAD\

Establish Standard ROFA With Threshold Relocation Runway 4R

Runway Safety Area Study
Runway 4R-22L

March 2004



Source: Base Map ORD ALP, October 2003
Prepared By: Ricondo & Associates, Inc.

Exhibit 4B

RICONDO & ASSOCIATES

0 300 feet

north

N:\CHICAGO\ORD-RSA Study (Rwy 4R-22L)\CAD\

Establish Standard ROFA With Threshold Relocation Runway 22L

3.3 Establish Standard RSA With Threshold Relocation

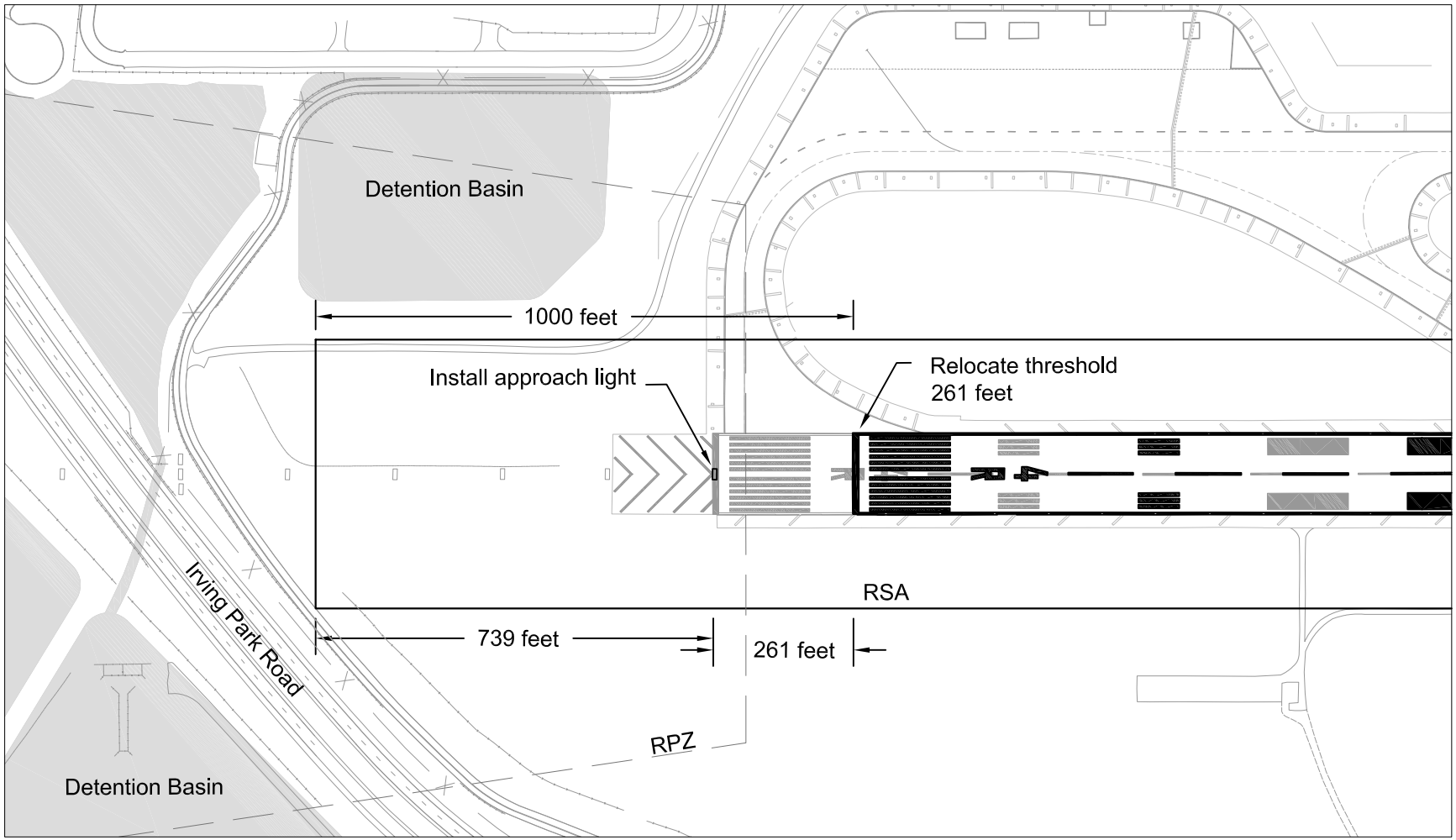
If available lengths on Runway 4R-22L were adjusted solely based on protecting for a standard RSA, absent the additional width required for the runway obstacle free area, the impacts on runway length would be reduced. **Exhibit 5A** illustrates the modifications necessary at the approach end of Runway 4R to accomplish this objective. A review shows the threshold for Runway 4R would need to be relocated 261 feet making this distance unavailable for all operations except departures on Runway 4R. A similar review at the approach end of Runway 22L, illustrated on **Exhibit 5B**, shows 502 feet of runway length would be lost for all operations except for departures on Runway 22L. The combined actions at each runway end (i.e., Exhibits 5A and 5B) would alter the landing length on Runways 4R and 22L to the center 7,328 feet available. Departure lengths would be 7,589 feet for Runway 4R and 7,830 feet for Runway 22L.

3.4 Install EMAS

FAA's recently issued Order 5200.9; *Financial Feasibility and Equivalency of Runway Safety Area Improvements and Engineered Material Arresting Systems* provides guidance on the use of EMAS as a suitable substitute for cases where a standard full RSA is either unattainable or otherwise impractical to establish. Based on the maximum certificated takeoff weight of the largest aircraft using the runway (B747-400 considered for Runway 4R-22L), and the requirement for stopping the aircraft leaving the runway traveling at 70 knots, the draft guidance provides the length required for the EMAS arrestor bed as well as the required setback from the runway end. The draft guidance furthermore states that EMAS does not provide a benefit for aircraft that touchdown prior to the threshold and therefore a standard installation may also include a displaced threshold. If the approach end of the runway has vertical guidance, then 600 feet should be provided between the end of the EMAS bed and the runway threshold to accommodate undershoots.

Exhibit 6A illustrates the installation of EMAS at the approach end of Runway 4R. The EMAS arrestor bed considered for use on the Runway 4R end has a design length of 565 feet setback of 75 feet from the runway end. The distance between the end of the EMAS bed and the runway threshold is 640 feet to protect for undershoots of aircraft landing on Runway 4R and to protect for overruns for the design aircraft landing or departing Runway 22L. The width of the bed is 170 feet with an overall site preparation area width of 200 feet to accommodate a ramp up for maintenance and CFR vehicles.

The installation of EMAS at the approach end of Runway 22L is illustrated on **Exhibit 6B**. A review shows, given the constraints of the site, only 518 feet of an arrestor bed can be accommodated (versus the desired 565 feet) with the 75 feet of setback. With the installation of EMAS at the approach end of Runway 22L, the landing threshold would be displaced 102 feet. Under the conditions of EMAS at both runway ends, the current full 8,091 feet would be available for landings on Runway 4R and departures on both Runway 22L and Runway 4R. Landings on Runway 22L would be reduced to 7,989 feet.



Source: Base Map ORD ALP, October 2003
Prepared By: Ricondo & Associates, Inc.

Exhibit 5A

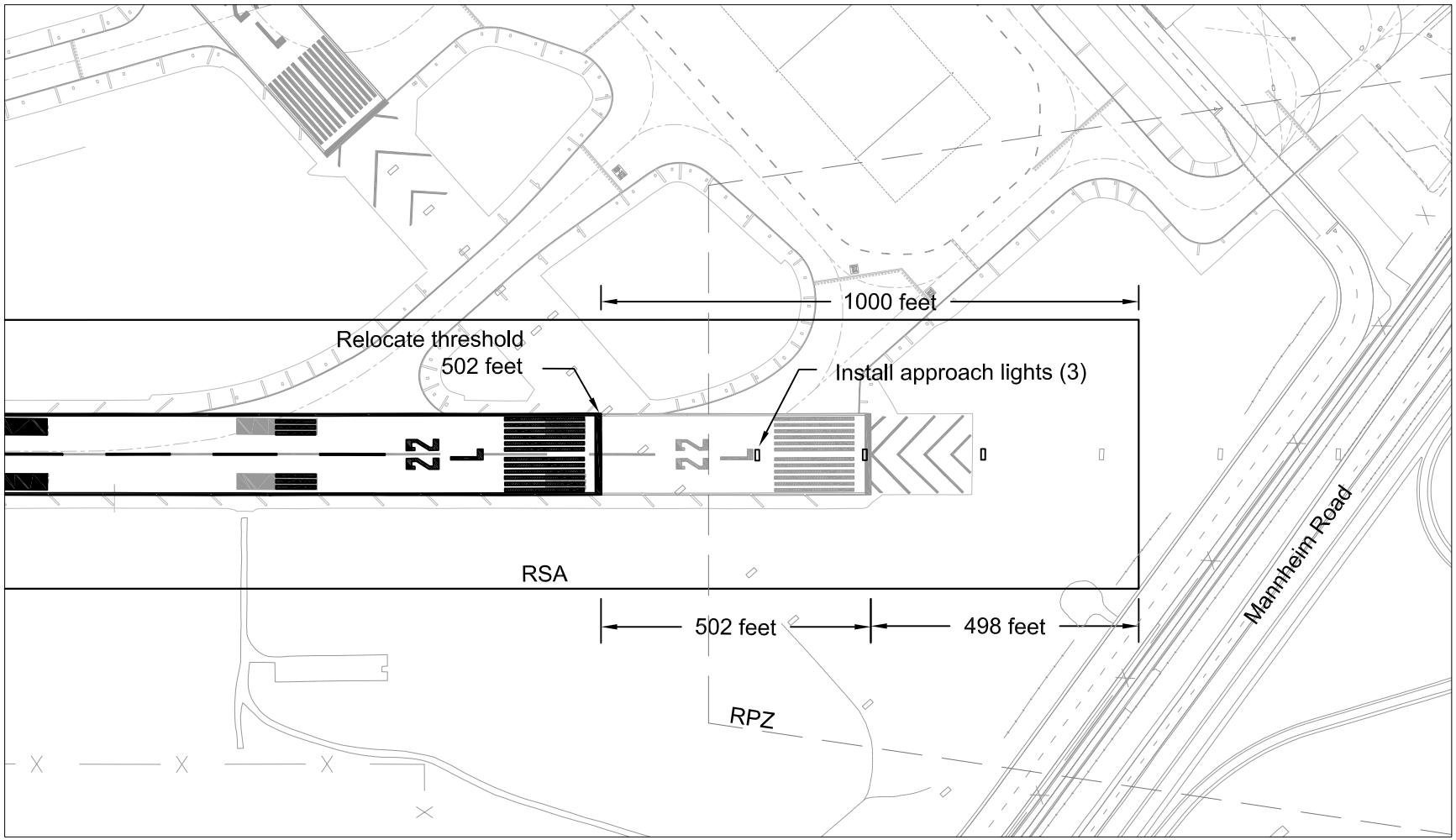
RICONDO & ASSOCIATES

0 300 feet

north

N:\CHICAGO\ORD-RSA Study (Rwy 4R-22L)\CAD\

Establish Standard RSA With Threshold Relocation Runway 4R



Source: Base Map ORD ALP, October 2003
Prepared By: Ricondo & Associates, Inc.

Exhibit 5B

RICONDO & ASSOCIATES

0 300 feet

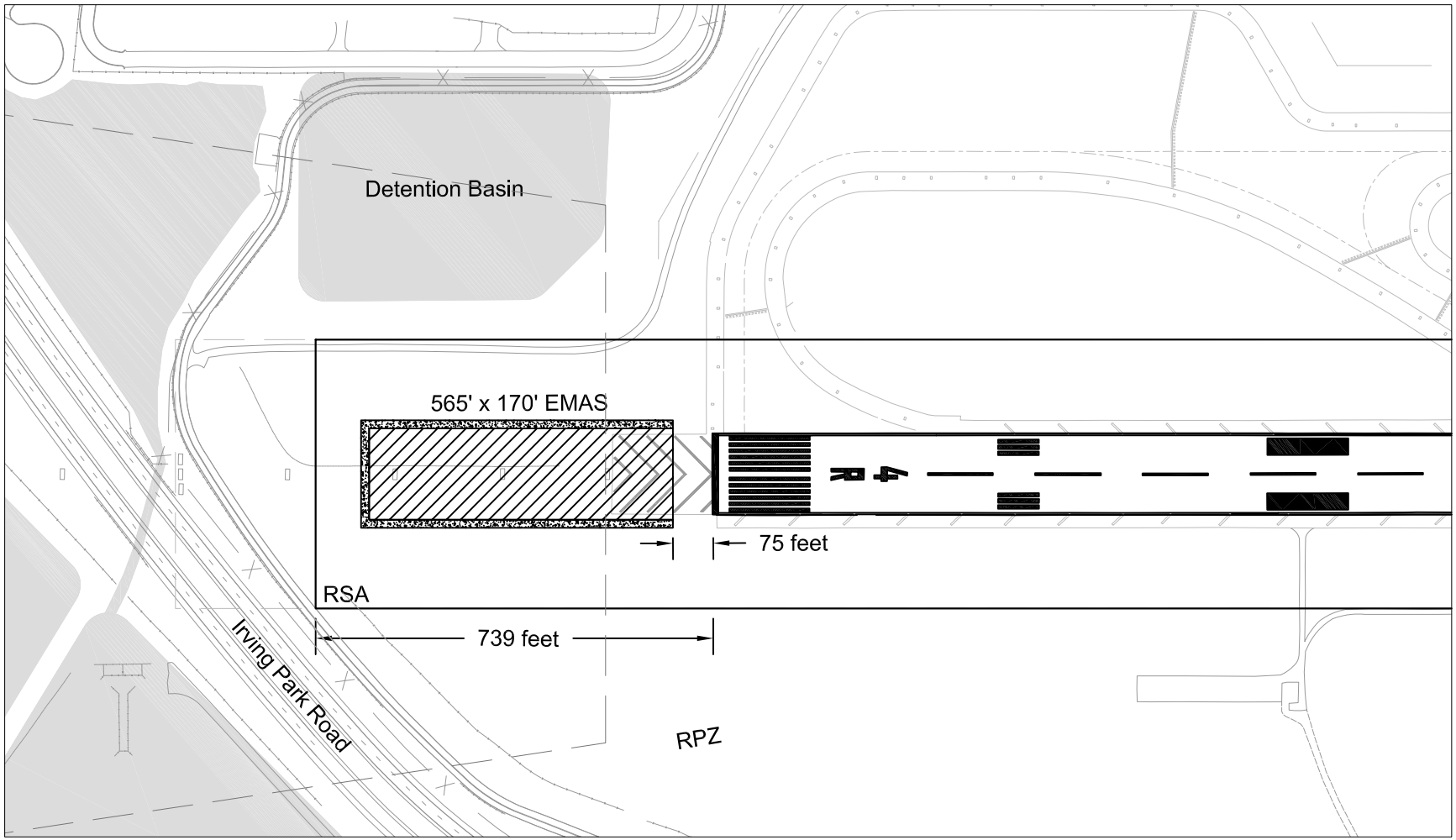
north

N:\CHICAGO\ORD-RSA Study (Rwy 4R-22L)\CAD\

Establish Standard RSA With Threshold Relocation Runway 22L

Runway Safety Area Study
Runway 4R-22L

March 2004



Source: Base Map ORD ALP, October 2003
Prepared By: Ricondo & Associates, Inc.

Exhibit 6A

RICONDO & ASSOCIATES

0 300 feet

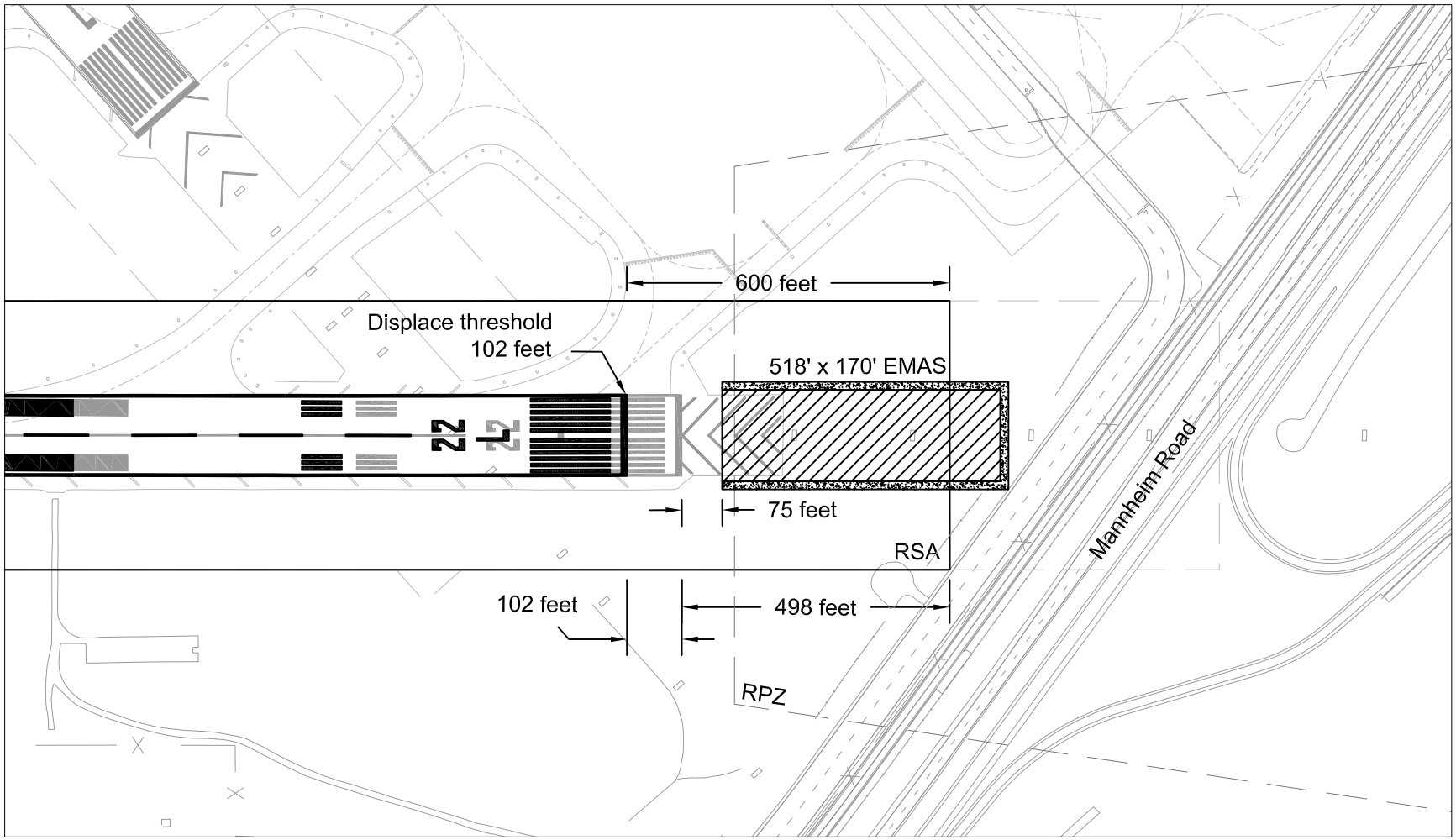
north

N:\CHICAGO\ORD-RSA Study (Rwy 4R-22L)\CAD\

Install EMAS Runway 4R

Runway Safety Area Study
Runway 4R-22L

March 2004



Source: Base Map ORD ALP, October 2003
Prepared By: Ricondo & Associates, Inc.

Exhibit 6B

RICONDO & ASSOCIATES

0 300 feet

north

N:\CHICAGO\ORD-RSA Study (Rwy 4R-22L)\CAD\

Install EMAS Runway 22L

IV. Evaluation of RSA Alternatives

The RSA alternatives described in the previous section, which include acquiring land to provide a standard RSA, relocating the runway threshold to establish a standard RSA at each end, and the installation of an EMAS arrestor barrier in lieu of standard RSA development, were subjected to an evaluation process considering cost and potential aircraft operational impacts.

4.1 Evaluation Methodology

Each of the RSA enhancement alternatives was subjected to an operational evaluation based on the use of Runway 4R-22L in the overall operation of O'Hare International Airport, as well as the aircraft types using the runway and their departure destinations. The use of Runway 4R-22L is summarized on **Table 4-1**.

Table 4-1

Operating Characteristics of Runway 4R-22L

Operation	Runway Configuration Percent Use	Plan	Origin / Destination Direction
Runway 4R			
Landing	36.4%	X	Southeast, south, southwest
Departing	n/a	n/a	n/a
Runway 22L			
Landing (1)	11.8%	B	Southeast, south, southwest
Departing (plan W)	41.5%	W	East, south (2)
Departing (plan B)	11.8%	B	East, south (2)
Departing (plan B mod)	4.3%	B-Modified	Not currently used due to change in LAHSO procedures
Departing (IFR 27)	3.8%	IFR 27s	South
Departing (IFR 14)	2.2%	IFR 14s	South and international over east and north fixes (3)
Departing (TOTAL)	63.6%	n/a	n/a

(1) During periods of heavy arrival demand, Runway 22L is used as a third arrival stream
(2) Can also be used to accommodate westbound departures during periods of heavy westbound departure demand
(3) Can also be used to accommodate eastbound departures during periods of heavy eastbound departure demand

Source: O'Hare International Airport Master Plan
Prepared By: Ricondo & Associates, Inc.

A review of Table 4-1 shows Runway 4R-22L is used as part of all operating configurations, but it is primary used for departures on Runway 22L (63.6% total time) and arrivals on Runway 4R (36.4% total time). Additionally, under Plan B (11.8% of the time) Runway 22L is used as a third arrival stream meaning the runway may potentially serve both takeoffs and landings during that operating configuration.

To assist in the evaluation of changes in runway length, **Table 4-2** provides a summary of runway length requirements used in the O'Hare International Airport Master Plan. A review of Table 4-2 shows the B747-400 is the critical aircraft for landing needing 8,000 feet for a maximum landing under wet runway conditions. On this basis, all aircraft currently have maximum landing weight capability on Runways 4R or 22L. Similarly, eight (8) of seventeen (17) aircraft types listed require takeoff lengths greater than the existing length under the higher temperature conditions stated to achieve the maximum certificated takeoff weight.

Subsequent to the operational analyses, the unit costs for EMAS and lighting and runway marking changes were based in large measure on cost estimates developed by Ricondo & Associates based on previous experience. To these unit construction costs, 30 percent was added for contingency and 20 percent was added to the total amount to account for soft costs of design, inspection, insurance and financing. A cost summary sheet for each alternative is contained in the appendix to this report.

4.2 Runway 4R-22L Alternatives Evaluation

A total of six (6) alternatives were considered for RSA improvement for Runway 4R-22L, including the "No Action" alternative, each of which are evaluated separately, as follows.

4.2.1 Establish Standard RSA Through Land Acquisition

Acquiring land and removing obstacles to provide a standard RSA, as depicted earlier in Exhibits 3A and 3B, would have no impacts to the existing runway length or airfield geometry. However, two major roads (Irving Park Road and Mannheim Road), Airport service roads, and the Airport fence would need to be relocated. There is the potential for major wetlands impacts in the approach area to Runway 4R because Irving Park Road is relocated into areas currently used as detention basins. Because of significant impacts to the road network, the estimated cost of this alternative is $29.3M. This is believed to be a conservative estimate, because the cost is based on a conceptual roadway alignment. The actual roadway alignment, designed to meet appropriate standards, may require additional roadway length to increase the turn radius of various curves. Additional roadway length would increase the cost of this alternative.

4.2.2 Establish Standard RSA and ROFA by Threshold Relocations

A review of runway length requirements in Table 4-2 identified the B747-400 as an aircraft type needing 8,000 feet of runway length to achieve a maximum landing weight under wet runway conditions. The alteration of landing length under this alternative to 7,090 feet for both runway ends would limit the maximum landing weight for the B747-400 to 555,000 lbs., or a reduction from the maximum landing weight of 75,000 lbs. This alternative additionally reduces the departure length on Runways 4R and 22L to 7,480 feet and 7,701 feet, respectively. A review of Table 4-2 for departure runway length requirements shows ten (10) of the listed seventeen (17) aircraft types require greater than 7,700 feet of runway length to achieve a maximum takeoff weight. Given Runway 22L

Table 4-2

Runway Length Requirements

Aircraft Model	Maximum Design Takeoff Weight	Maximum Design Landing Weight	Takeoff (1)	Wet Landing (2)	Aircraft Powerplant
Small Narrow Body					
A319	141,096	134,481	6,150	5,200	CFM56-5A
A320	162,037	142,196	8,100	5,850	IAE V2500[3/]
B737-200	128,100	107,000	8,550	5,700	JT8D-17R/17AR
B737-300	138,500	115,800	7,850	5,400	CFM 56-3B2
B737-500	133,500	110,000	9,250	5,250	CFM 56-3B-1 (20,000 LB SLST)
B737-800	174,200	146,300	8,400	6,300	CFM 56-7B26[3/]
DC9-41	114,000	102,000	7,400	5,650	JT8D-15[3/]
MD87	149,500	130,000	8,200	5,600	JT8D-217C
CRJ-100ER	51,000	47,000	7,200	5,000	2 GE CF 34-3A1
CRJ-200ER	53,000	47,000	7,400	5,750	2 GE CF 34-3B1
EMB-145ER	45,415	41,226	6,950	5,250	AE3007A
Fokker-100 (3)	98,000	88,000	6,725	5,400	TAY MK 650
Medium Narrow Body					
B757-200 (4)	255,000	210,000	7,350	5,750	RB211-535E4B
Medium Wide Body					
B767-300ER	407,000	320,000	9,900	6,075	CF6-80C2-B6, PW4060, RB211-524H
B777-200 (Baseline Aircraft)	535,000	445,000	8,000	5,950	Pratt & Whitney Engines
B777-200 (High Gross Weight)	632,500	460,000	10,900	6,100	Pratt & Whitney Engines
Large Wide Body					
B747-400 (5)	875,000	630,000	11,000	8,000	RB211-524G2

(1) Takeoff runway length requirements based on 83.5° F (unless otherwise indicated), calm winds, dry pavement conditions, maximum allowable flaps setting, and maximum certified takeoff weight.
(2) Landing distance requirements based on ISA conditions, calm winds, wet pavement conditions, maximum allowable flaps setting, and maximum certified landing weight.
(3) Fokker-100 (Version II) takeoff distance required is estimated under 92.5° F
(4) B757-200 takeoff distance required is estimated under 81.7° F.
(5) B747-400 takeoff distance required is estimated under 89.4° F.

Source: Table IV-4 Runway Length Requirements, O'Hare International Airport Master Plan
Prepared by: Ricondo & Associates, Inc.

is used 64 percent of the time for departures (sum of all operating configurations) the reduction in length to 7,701 feet is considered substantial considering it accommodates westbound departures under high demand periods (Plan W and Plan B) and international departures over east and north fixes under Plan IFR 14s.

4.2.3 Establish Standard RSA by Relocation of Runway Thresholds

Landing length under this alternative is limited to the center 7,328 feet of runway length. This length, albeit greater than the previous alternative, would limit the maximum landing weight under wet runway conditions for the B747-400 to 578,000 lbs., or a reduction from maximum weight of 52,000 lbs. The departure length on Runway 22L is only incrementally better than the previous alternative at 7,830 feet (versus 7,701 feet) and as such a similar number of aircraft types listed on Table 4-2 could not achieve a maximum takeoff weight at higher temperatures.

4.2.4 Install EMAS at Both Runway Ends

Operationally, there is no change in the departure lengths or the landing length on Runway 4R with this alternative. However, landing length available for both Runways 4R and 22L would be reduced 102 feet to a total landing distance of 7,989 feet. This would have a weight penalty on the B747-400, which requires 8,000 feet of runway for landing under wet runway conditions.

The installation of an EMAS arrestor bed at the approach end of each runway end as well as displacing the Runway 22L landing threshold as illustrated on Exhibits 6A and 6B would cost approximately $35.9M. Included in this amount are construction costs of $35.4M for site preparation and installation of the EMAS at the runway ends and incremental EMAS life cycle costs. The remaining costs are to remark the runway for the relocated Runway 22L threshold and relocate one glide slope antenna.

4.2.5 Install EMAS at Runway 22L / Relocate Runway 4R Threshold

This alternative combines two of the alternatives previously discussed. As shown in Exhibit 6B, EMAS would be installed on the Runway 22L end and the landing threshold would be displaced 102 feet. As shown in Exhibit 5A, Runway 4R threshold would be relocated 261 feet. In this arrangement, Runway 22L would have 7,728 feet available for landings and 7,830 feet for departures. Runway 4R would have 7,830 feet available for landings or departures. There would be a 6,000 lbs. weight penalty for B747-400 aircraft landing on Runway 4R or 22L in wet runway conditions.

The estimated cost of this new alternative is $18.0M, over 75%, which is for EMAS construction including life cycle costs. The remainder is for remarking the runway, moving two glide slope antennas, and modifying the Runway 4R approach light system.

4.2.6 No Action Alternative

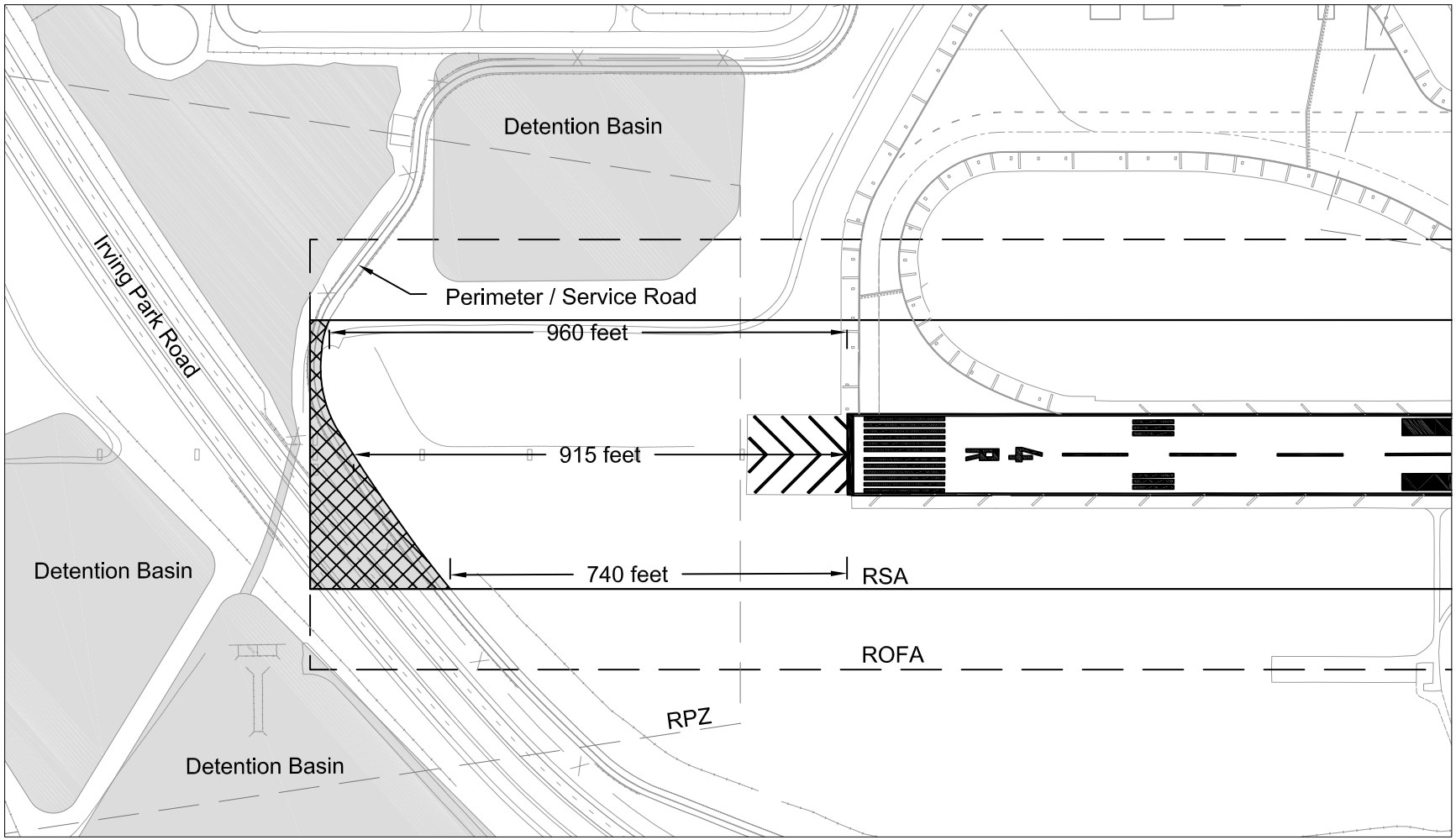
In this alternative, no major improvements are made to the existing RSA other than relocating the windsock (Exhibit 1, Object 11) outside the RSA. While Exhibits 2A and 2B depict the available full-width RSA, **Exhibits 7A** and **7B** depict the extent of the available RSA at Runway 4R and 22L, respectively. A review of Exhibit 7A shows the RSA is limited in length by the presence of the existing Perimeter / Service Road. The length of available RSA along the western edge is 960 feet reducing to 739 feet along the eastern edge. The length of RSA along the extended runway centerline is 915 feet. The available RSA is more than 90% of the standard RSA.

Exhibit 7B shows that the length of the full-width RSA is limited by the Service / Snow Road, and ranges from 498 feet at the east end to 860 feet at the west end. The length of the RSA along the extended runway centerline is 680 feet. The available RSA is approximately 68% of the area comprising a standard RSA. The no action alternative has no operational impacts.

The "No Action" alternative may be determined to be acceptable given the context of guidance in FAA Order 5200.9. The Order places special importance on the first 600 feet of RSA to accommodate undershoots. For the purposes of this assessment, we are referring to the first 600 feet of full RSA as the "Critical Area", depicted on **Exhibits 8A** and **8B**. Exhibit 8A shows that the RSA Critical Area is more than adequately contained within the available RSA.

A review of Exhibit 8B shows the full-width RSA Critical Area is essentially intact except for a small portion at the northeast corner brought about by the 60-foot width of the Service / Snow Road. This road is not a public use roadway, and based on the Service Road Study performed in support of the O'Hare Modernization Program, movements are estimated at around 30 vehicles during the peak hour. Planned changes to the staging areas for snow removal equipment could also eliminate the need for snow removal equipment to use this roadway. When this happens, the roadway width could be narrowed to 24 feet, thus reducing the amount of infringement into the Critical Area.

Given that Runway 4R departures seldom (if ever) occur and the identified Critical Area at the approach end of Runway 22L is essentially sufficient in size to accommodate a Runway 22L landing undershoot, the issue needing to be addressed is the adequacy of the available area to accommodate a Runway 4R landing overrun. Given the high cost of installing EMAS, estimated at $18.0M, the negative impact to operations and the availability of a nearly full Critical Area, a strong argument can be made that the expenditure of funds for RSA improvement is not practicable.



Source: Base Map ORD ALP, October 2003
Prepared By: Ricondo & Associates, Inc.

Exhibit 7A

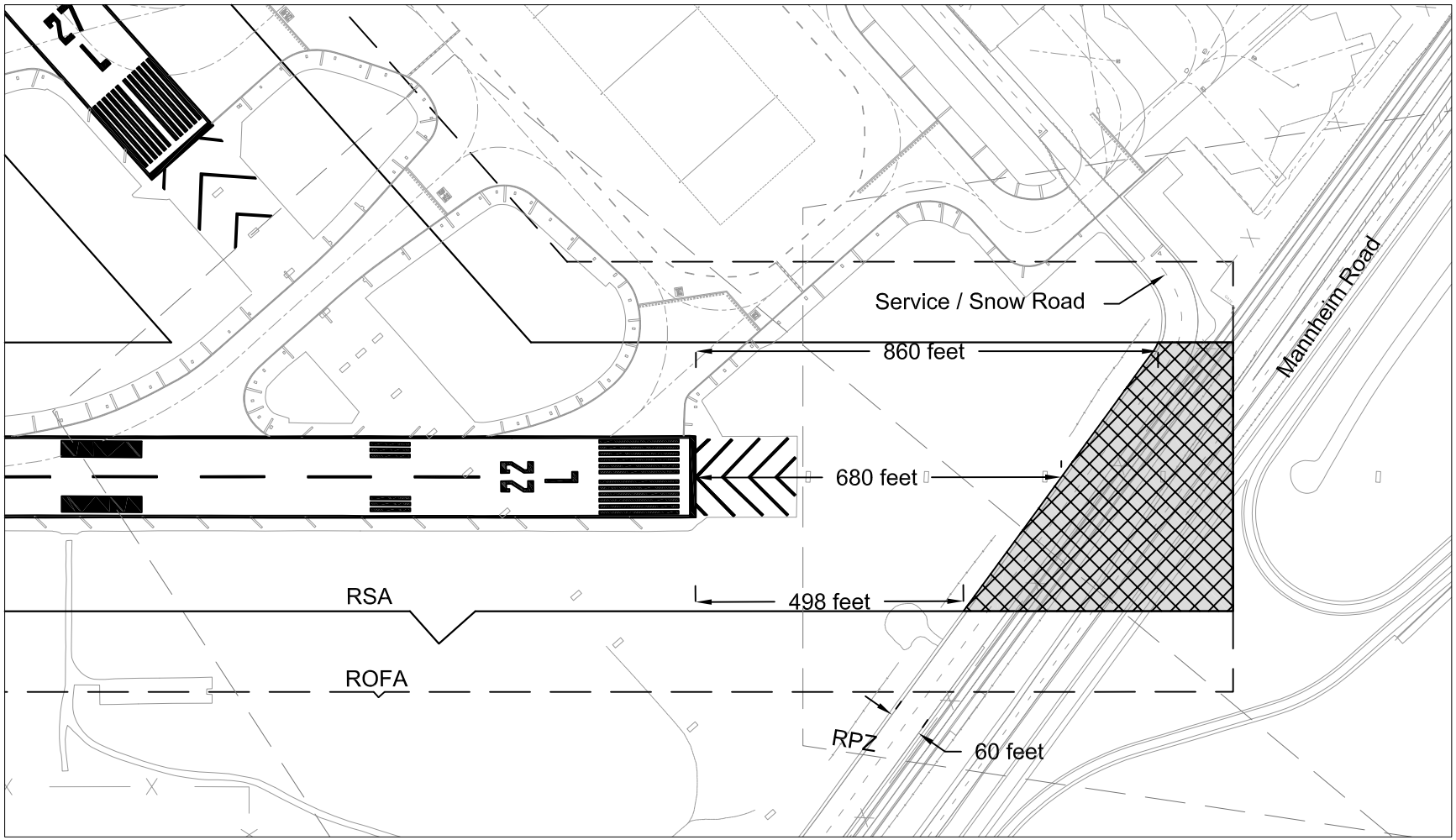
RICONDO & ASSOCIATES

0 300 feet

north

N:\CHICAGO\ORD-RSA Study (Rwy 4R-22L)\CAD\

Available Runway Safety Area
Runway 4R



Source: Base Map ORD ALP, October 2003
Prepared By: Ricondo & Associates, Inc.

Exhibit 7B

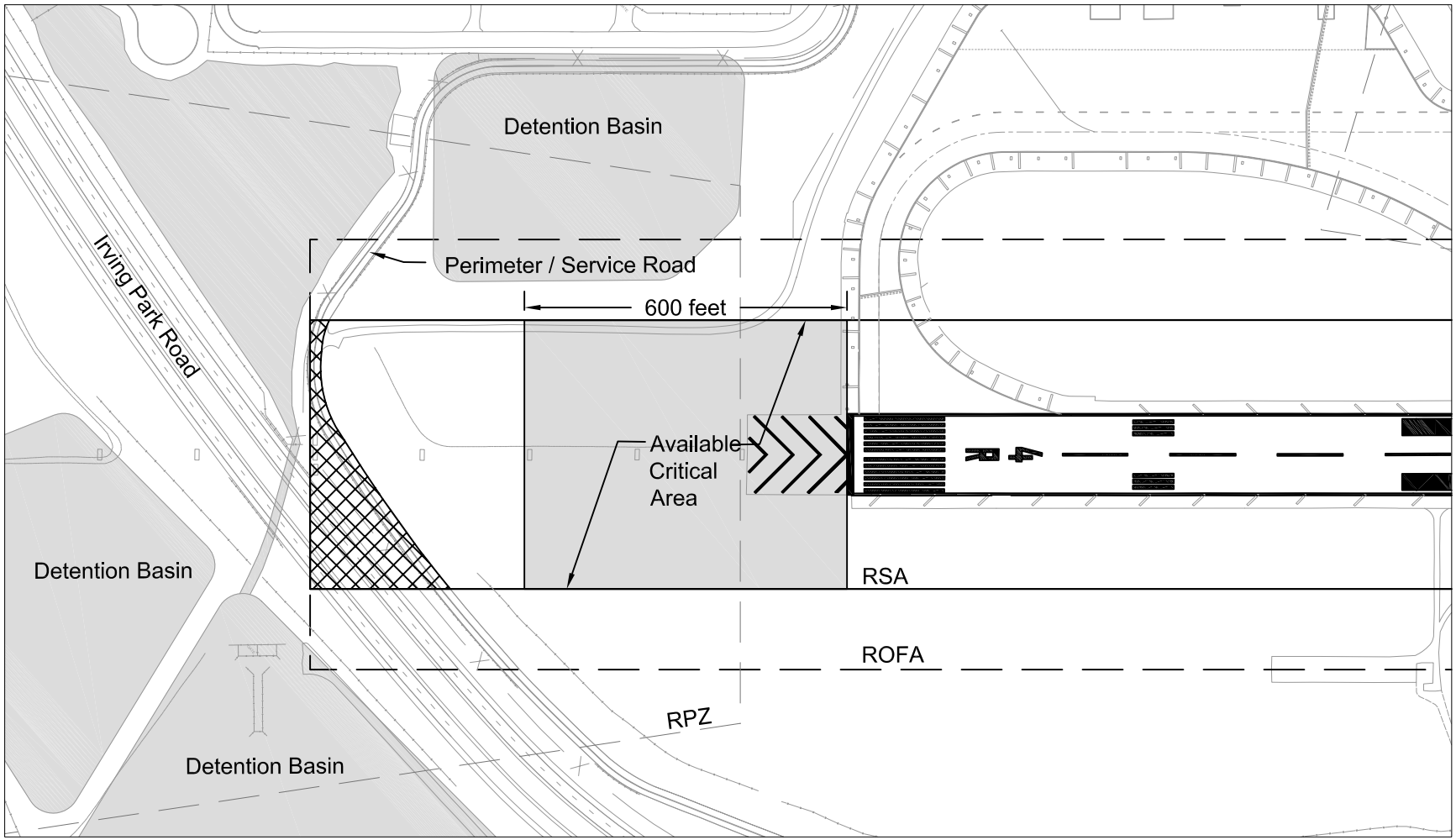
RICONDO & ASSOCIATES

0 300 feet

north

N:\CHICAGO\ORD-RSA Study (Rwy 4R-22L)\CAD\

Available Runway Safety Area
Runway 22L



Source: Base Map ORD ALP, October 2003
Prepared By: Ricondo & Associates, Inc.

Exhibit 8A

RICONDO & ASSOCIATES

0 300 feet

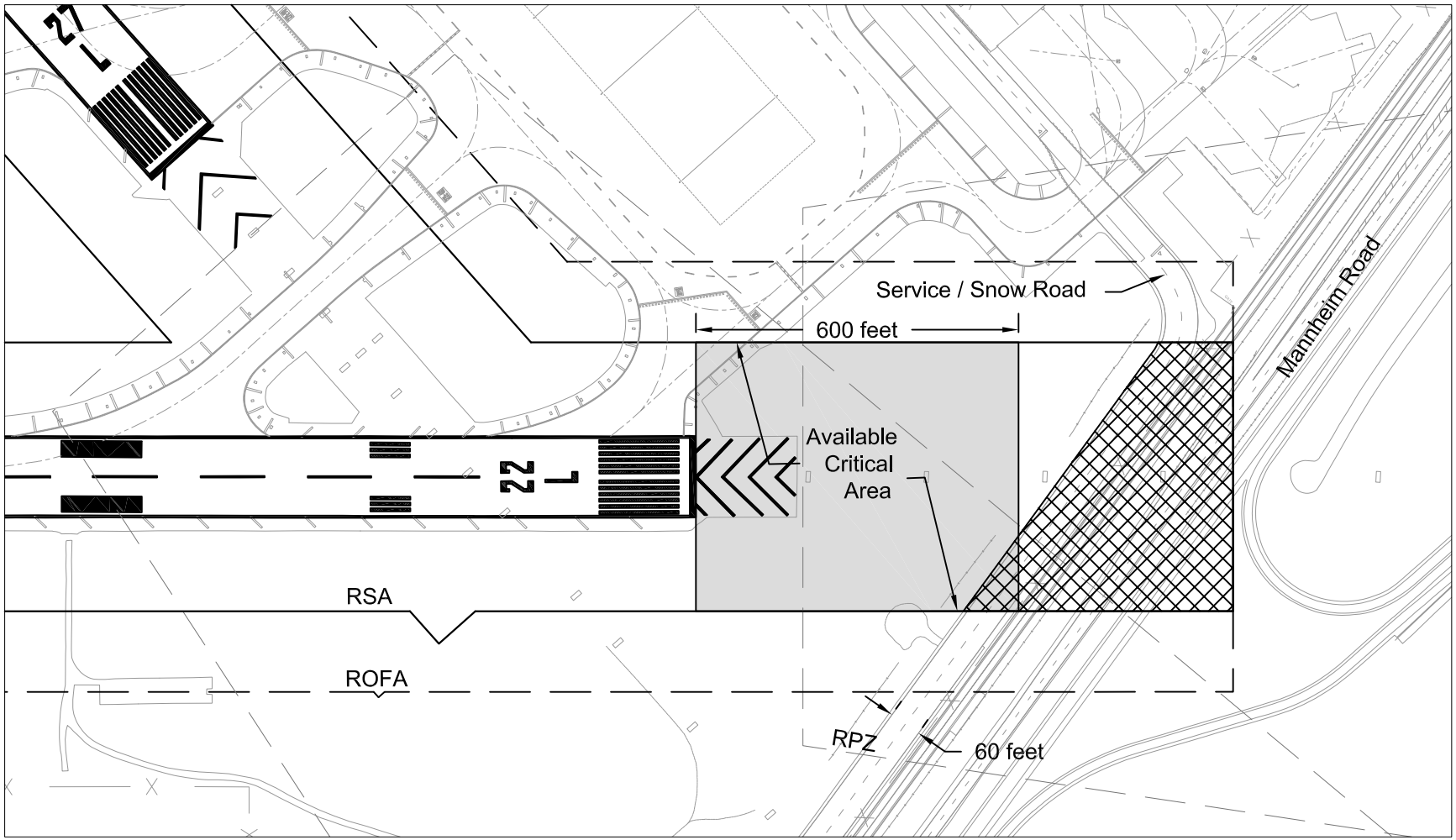
north

N:\CHICAGO\ORD-RSA Study (Rwy 4R-22L)\CAD\

Available Critical RSA
Runway 4R

Runway Safety Area Study
Runway 4R-22L

March 2004



Source: Base Map ORD ALP, October 2003
Prepared By: Ricondo & Associates, Inc.

Exhibit 8B

RICONDO & ASSOCIATES

0 300 feet

north

N:\CHICAGO\ORD-RSA Study (Rwy 4R-22L)\CAD\

Available Critical RSA
Runway 22L

4.3 Alternatives Comparison

The following **Table 4-3** provides a summary of the evaluation factors associated with the RSA enhancement alternatives considered for Runway 4R-22L

Table 4-3

Summary of Evaluation Factors for Runway 4R-22L

Alternative RSA Enhancement	Operational Impacts: Landing	Operational Impacts: Takeoff	Cost
Establish Standard RSA through land acquisition	No impacts	No impacts	$29.3M
Establish Standard RSA and ROFA by Relocating Runway Thresholds	75,000 lbs. reduction in maximum wet runway landing weight for B747-400	Three additional aircraft types lose maximum takeoff weight capability; additional payload restrictions for eight aircraft types	Not Operationally Practicable ($1.03M)
Establish Standard RSA By Relocating Runway Thresholds	52,000 lbs. reduction in maximum wet runway landing weight for B747-400	Three additional aircraft types lose maximum takeoff weight capability; additional payload restrictions for eight aircraft types.	Not Operationally Practicable ($1.0M)
Install EMAS at both runway ends (Runway 22L threshold displaced 102 feet)	A reduction in maximum wet runway landing weight for B747-400 landing Runway 22L	No Impacts	$35.9M
Install EMAS at Runway 22L end & Relocate Runway 4R threshold	Reduction in maximum wet runway landing weight of 6,000 lbs. for B747-400 landing Runway 4R&22L.	One additional aircraft type loses maximum takeoff weight capability; additional payload restrictions for eight aircraft types	Not Operationally Practicable ($18.0M)
No Action	No impacts	No impacts	None

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

- Land Acquisition Option

A review of the information summarized on Table 4-3 shows that the alternative with the least impact to the existing runway (other than the "No Action" alternative)—establishing a full RSA with land acquisition and roadway relocation has an estimated cost of $29.3M. It should be noted that this cost estimate is believed to be fairly conservative, since there are very likely to be additional costs incurred with relocating major roads and mitigating environmental impacts not considered in this

estimate. In addition, the FAA has a goal of addressing RSA deficiencies by the year 2007, and it is unlikely that roadways could be relocated in this time frame.

- Displaced Threshold Options

The two alternatives of shortening the runway to establish full RSAs are indeed the least costly to implement, but the operational impacts would be severe. Runway 4R is a high-use landing runway, used 36.4 percent of the time (Plan X), and landing capability for the B747-400 under wet runway conditions would be severely impacted. Runway 22L is similarly a high-use departure runway and two (2) additional aircraft types would lose maximum takeoff weight capability and at higher temperatures if RSAs were to be established at the sacrifice of runway length. Furthermore, eight (8) aircraft types would incur additional departure payload penalties during departures on Runway 22L.

- EMAS Option

The installation of EMAS at both ends at a cost of $35.9M would not have a substantial adverse impact on aircraft operations. The full existing runway length of 8,091 feet remains available for departures and landings length on Runway 4R. A reduction from maximum landing weight would apply to B747-400 aircraft landing on Runway 22L in wet conditions.

The high cost of installing EMAS at both runway ends raises the question as to whether it is practical to spend such large sums of money for RSA improvement. The FAA recently issued Order 5200.9, *Financial Feasibility and Equivalency of Runway Safety Area Improvements and Engineered Material Arresting System.* According to this Order, the maximum feasible cost to spend for both runway ends is $23.8M, based on the B747-400 as the critical aircraft type and the resulting need for an EMAS length of 565 feet. The estimated cost of the EMAS option is greater than the maximum feasible cost.

- EMAS 22L / Displaced Threshold 4R Option

The operating configurations of the runway were considered to develop the fifth alternative, where EMAS would be installed only at the Runway 22L end. The Runway 4R threshold would be relocated 261 feet to provide a full-length RSA for landings. Due to the relocated threshold, there would be a 6,000 lbs. reduction from maximum landing weight for B747-400 aircraft landing either Runway 4R or 22L during wet runway conditions. Furthermore, two (2) additional aircraft would be limited to less than maximum gross weight take-off runway length requirements and eight (8) aircraft types would incur additional departure payload penalties during departures on Runway 22L.

The available 739 feet of full-width RSA available beyond the departure end of the runway is believed to be adequate because aborted takeoffs are infrequent and an overshoot due to a long landing would be covered by the existing RSA that is already more than 90% of a standard RSA. Runway 22L is occasionally used for landings during heavy arrival demand when operating configuration Plan B is in effect, occurring less than 12 percent of the time. While the available full-width RSA is less than the standard 1,000 feet, it is believed to provide an adequate option for the occasional aircraft that uses Runway 22L for landing.

Runway 4R is configured for landings 36 percent of the time, and is not used for departures. Landing aircraft would have the benefit of a full RSA on the approach and long landings would be protected by the EMAS installation.

As stated above, the cost of installing EMAS at the 22L end and relocating the glideslope, lighting and marking at the 4R ends is estimated to be $18.0M. The additional cost of constructing EMAS at the approach end of Runway 4R to correct a 261 foot RSA deficiency is estimated to be $17.5M, which does not seem justified based on the following three reasons. First, because the Runway 4R threshold is relocated 261 feet, landings are protected by a standard 1,000 foot RSA on the approach end and by EMAS off the departure end. Second, departures on Runway 22L are protected by 739 feet of full-width RSA beyond the departure end in the case of an aborted takeoff. Third, landings on Runway 22L occur occasionally, only during periods of high arrival demand when one particular Airport operating configuration is in use (less than 12 percent of the time). Runway 22L landings would be protected by 739 feet of full-width RSA beyond the departure end. The safety benefits of providing EMAS at the approach end to Runway 4R are marginal at best, and it does not seem prudent to spend $18.0M without an appreciable net gain.

Appendix

Cost Estimate Tables Used to Evaluate RSA Alternatives

Table A-1

Estimated Project Cost of Establishing Standard RSA

Item	Unit Cost	Units	Cost
RUNWAY 4R END			
Land Acquisition	$500,000 per acre	6	$3,000,000
Wetland Mitigation	$450,000 per acre	3	$1,350,000
Roadway Pavement	$9 per square foot of new pavement	260,000	$2,340,000
Roadway Costs	$145 per linear foot per two lanes	4,800	$696,000
Roadway Lump Sum	$600,000 per two lanes	3	$1,800,000
Roadway Demolition	$30 per square yard for pavement removal	18,000	$540,000
Grading RSA	$15 per square yard	14,000	$210,000
Security Fence	$30 per linear foot of new fence	1,300	$26,000
		SUBTOTAL:	$9,960,000
RUNWAY 22L END			
Roadway Pavement	$9 per square foot of new pavement	500,000	$4,500,000
Roadway Costs	$145 per linear foot per two lanes	7,200	$1,044,000
Roadway Lump Sum	$600,000 per two lanes	3	$1,800,000
Roadway Demolition	$30 per square yard for pavement removal	30,000	$900,000
Grading RSA	$15 per square yard	35,000	$525,000
Security Fence	$30 per linear foot of new fence	1,700	$34,000
		SUBTOTAL:	$8,803,000
FULL PROJECT			
Runway 4R End			$9,960,000
Runway 22L End			$8,803,000
		SUBTOTAL:	$18,760,000
Contingency	30% of project cost		$5,628,000
		SUBTOTAL:	$24,388,000
Soft costs	20% of project cost with contingency		$4,880,000
PROJECT COST			**$29,300,000**

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Table A-2

Estimated Project Cost of Establishing Standard RSA and ROFA With Threshold Relocation

Item	Unit Cost	Units	Cost
RUNWAY 4R END			
Marking	$75,000 to restripe 1/2 of runway	1	$75,000
Glideslope	$220,000 to relocate glideslope	1	$220,000
Approach lights	$5,000 for in-pavement lights	2	$10,000
Approach lights	$1,500 to modify or remove existing light station	6	$9,000
		SUBTOTAL:	$314,000
RUNWAY 22L END			
Marking	$75,000 to restripe 1/2 of runway	1	$75,000
Glideslope	$220,000 to relocate glideslope	1	$220,000
Approach lights	$5,000 for in-pavement lights	3	$15,000
Approach lights	$1,500 to modify or remove existing light station	7	$10,500
		SUBTOTAL:	$321,000
FULL PROJECT			
Runway 4R End			$314,000
Runway 22L End			$321,000
Signage	$1,500 per relocated distance remaining sign	16	$24,000
		SUBTOTAL:	$659,000
Contingency	30% of project cost		$197,700
		SUBTOTAL:	$856,700
Soft costs	20% of project cost with contingency		$171,000
PROJECT COST			**$1,030,000**

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Table A-3

Estimated Project Cost of Establishing Standard RSA With Threshold Relocation

Item	Unit Cost	Units	Cost
RUNWAY 4R END			
Marking	$75,000 to restripe 1/2 of runway	1	$75,000
Glideslope	$220,000 to relocate glideslope	1	$220,000
Approach lights	$5,000 for in-pavement lights	1	$5,000
Approach lights	$1,500 to modify or remove existing light station	4	$6,000
		SUBTOTAL:	$306,000
RUNWAY 22L END			
Marking	$75,000 to restripe 1/2 of runway	1	$75,000
Glideslope	$220,000 to relocate glideslope	1	$220,000
Approach lights	$5,000 for in-pavement lights	2	$10,000
Approach lights	$1,500 to modify or remove existing light station	6	$9,000
		SUBTOTAL:	$314,000
FULL PROJECT			
Runway 4R End			$306,000
Runway 22L End			$314,000
Signage	$1,500 per relocated distance remaining sign	16	$24,000
		SUBTOTAL:	$644,000
Contingency	30% of project cost		$193,200
		SUBTOTAL:	$837,200
Soft costs	20% of project cost with contingency		$167,000
PROJECT COST			**$1,000,000**

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Table A-4

Estimated Project Cost of Installing EMAS

Item	Unit Cost	Units	Cost
RUNWAY 4R END			
EMAS site preparation	$14 per square foot	121,600	$1,700,000
EMAS installation	$78 per square foot	96,050	$7,490,000
		SUBTOTAL:	$9,190,000
RUNWAY 22L END			
EMAS site preparation	$14 per square foot	112,670	$1,580,000
EMAS installation	$78 per square foot	88,060	$6,870,000
Marking	$75,000 to restripe 1/2 of runway	1	$75,000
Glideslope	$220,000 to relocate glideslope	1	$220,000
		SUBTOTAL:	$8,750,000
FULL PROJECT			
Runway 4R End			$9,190,000
Runway 22L End			$8,750,000
		SUBTOTAL:	$17,940,000
Contingency	30% of project cost		$5,382,000
		SUBTOTAL:	$23,322,000
Soft costs	20% of project cost with contingency		$4,660,000
PROJECT COST			**$28,000,000**
Incremental EMAS Life Cycle Cost			$7,890,000
PROJECT COST WITH EMAS LIFE CYCLE COST			**$35,890,000**

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Table A-5

Estimated Project Cost of Installing EMAS at Runway 22L

Item	Unit Cost	Units	Cost
RUNWAY 4R END			
Marking	$75,000 to restripe 1/2 of runway	1	$75,000
Glideslope	$220,000 to relocate glideslope	1	$220,000
Approach lights	$5,000 for in-pavement lights	1	$5,000
Approach lights	$1,500 to modify or remove existing light station	4	$6,000
		SUBTOTAL:	$306,000
RUNWAY 22L END			
EMAS site preparation	$14 per square foot	112,670	$1,580,000
EMAS installation	$78 per square foot	88,060	$6,870,000
Marking	$75,000 to restripe 1/2 of runway	1	$75,000
Glideslope	$220,000 to relocate glideslope	1	$220,000
		SUBTOTAL:	$8,750,000
FULL PROJECT			
Runway 4R End			$306,000
Runway 22L End			$8,750,000
Signage	$1,500 per relocated distance remaining sign	16	$24,000
		SUBTOTAL:	$9,080,000
Contingency	30% of project cost		$2,724,000
		SUBTOTAL:	$11,804,000
Soft costs	20% of project cost with contingency		$2,360,000
PROJECT COST			**$14,200,000**
Incremental EMAS Life Cycle Cost			$3,770,000
PROJECT COST WITH EMAS LIFE CYCLE COST			**$17,970,000**

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

APPENDIX E

Runway Safety Area (RSA) Table

O'HARE MODERNIZATION PROGRAM (OMP)
AERONAUTICAL STUDY: 2003-AGL-0878-NRA
RUNWAY SAFETY AREAS (RSA)

Runway Safety Area (RSA)

Runway Safety Areas will be upgraded to current dimensions acceptable to the FAA Administrator at the time of significant construction, reconstruction or expansion. The runway safety areas extend beyond each existing runway end and are listed below. Where a non-standard condition exists, the OMP will provide for full-safety areas except as noted:

Runway End	Existing Condition	Standard[1]	Future OMP
04R	739'	1,000/600'	739'[2]
04L	870'	1,000/600'	967'[3]
09R	1,000'	1,000/600'	1,000'
09L	750'	1,000/600'	1,000'
14R	1,000'	1,000/600'	N/A
14L	1,000'	1,000/600'	N/A
22R	680'	1,000/600'	1,000'
22L	498'	1,000/600'	498'[4]
27R	750'	1,000/600'	1,000'
27L	1,000'	1,000/600'	1,000'
32R	1,000'	1,000/600'	N/A
32L	1,000'	1,000/600'	N/A

[1] The RSA standard is 1,000' beyond the runway end to enhance the safety in case of an aircraft overrun and 600' prior to runway threshold to enhance the safety of aircraft in case of an undershoot. Source: AC 150/5300-13 Change 8

[2] Request for Modification of Standards (MOS); Runway 4R RSA is over 90% of standard RSA dimensions with 960 feet at the northwest edge, 739 feet at the southeast edge and 915 feet at centerline. See Appendix D, Chicago O'Hare International Airport Runway 4R-22L Safety Area Practicability Study of May 4, 2004

[3] Request for Modification of Standard (MOS)

[4] Request for Modification of Standards (MOS); Runway 22L RSA is 68% of standard RSA dimensions with 860 feet at the northwest edge, 498 feet at the southeast edge and 680 feet at centerline. See Appendix D, Chicago O'Hare International Airport Runway 4R-22L Safety Area Practicability Study of May 4, 2004

APPENDIX F

Chicago O'Hare International Airport
Existing Airport Layout Plan – May 2005

NOTES

1) NO OFZ PENETRATIONS.

2) NO THRESHOLD SITING SURFACE OBJECT PENETRATIONS.

3) THE BUILDING RESTRICTION LINE (BRL) ENCOMPASSES RUNWAY AND TAXIWAY OBJECT FREE AREAS (OFAs), RUNWAY VISIBILITY ZONES AND NAVAID CRITICAL AREAS.

4) ON-AIRPORT SURVEY MONUMENTS ARE REPRESENTED BY CARSONITE SURVEY MARKER-S AND ARE LABELED "DO NOT DESTROY".

Terminal Area (000 - 400)

101 - Pedestrian Tunnel 1A
102 - Pedestrian Tunnel 1B
110 - Terminal 1, ATS Station (ATS-T1)
111 - Facility Power Substation 1 & 2
112 - Terminal 1, UPS Building
121 - Terminal 1
122 - Concourse B
125 - Terminal 1 Baggage & Pedestrian Tunnel
126 - Concourse C
190 - Post #7 Guardhouse
200 - Terminal 2 (Building #4)
201 - Pedestrian Tunnel 2A
202 - Pedestrian Tunnel 2B
203 - Pedestrian Tunnel 2C
204 - Pedestrian Tunnel 2D
205 - Concourse E/F & Concourse E/F Link
206 - Terminal 2, ATS Station (ATS-T2)
207 - Terminal 2, UPS Building
210 - Concourse E
215 - Concourse F
230 - Post #8 Guardhouse
250 - Rotunda (Building #6)
260 - Concourse G (Building #7)
290 - Post #9 Guardhouse
300 - Terminal 3 (Building #8)
303 - Pedestrian Tunnel 3A
304 - Pedestrian Tunnel 3B
305 - Concourse H/K & Concourse H/K Link
306 - Pedestrian Tunnel 3C
307 - Pedestrian Center #7
310 - Concourse H
315 - Concourse K
320 - Concourse L
321 - Traction Power Substation A / Facility Power Substation 3
322 - Terminal 3 UPS Building
323 - Terminal 3 ATS Station (ATS-T3)
324 - International Terminal 5 ATS Station
325 - International Terminal 5 / Concourse M
330 - Post #10 Guardhouse
400 - DOA Operations (Former ATCT Decommissioned In 1996)
402 - FAA Air Traffic Control Tower / ASDE (Completed in 1996)
405 - Hilton Hotel
406 - Traction Power Substation B / Facility Power Substation 4
407 - Pump House - Terminal 5
410 - Elevated Parking Structure (EPS)
411 - Transportation Center Boiler House
412 - Transportation Center
425 - Pump House - Parking Lot (Fire)
427 - Pump House Stairway Enclosure
430 - North Block House
432 - Intake Room #1
437 - Exhaust Room #2
438 - Exhaust Room #1
440 - Intake Room #2
441 - CTA Service Entrance
442 - Bus Dispatch
443 - CTA Air Intake
450 - H & R Building
452 - Chlorine Chemical Storage Building
454 - Acid Chemical Storage Building
456 - South Cooling Tower
457 - Southeast Cooling Tower
458 - FAA RTR Antennas and Building
460 - North Cooling Tower
462 - Commonwealth Edison Switchyard
464 - SBC Building
466 - SBC Garage
472 - City Substation RB-40 Building
474 - CTA Substation
475 - A.R.F.F. #3
480 - Taxiway Bridge Lift Station
490 - Sprinkler Control Room

Southeast Service Area (500)

500 - Post #4A Guardhouse
501 - Salt Storage
502 - Airport Maintenance Complex (AMC)
503 - Salt Storage
504 - Gate Gourmet Flight Kitchen
505 - City Glycol & Runway Deicer Facility
507 - City Gas Stand
509 - Post #4 Guardhouse
510 - Vacant (Former LYNX / Chicago Air Cargo)
511 - Sky Chef Flight Kitchen
513 - BAX Global (Former Burlington Northern)
514 - U.S. Post Office - International
515 - Air Canada
516 - JAL / EVA / BA Cargo
517 - Korean Air Cargo
519 - Police - CPD (Former City Warehouse)
521 - Mixed Use Building (Former Signature Flight Services Terminal)
522 - ATS Maintenance & Storage Facility Building / Facility Power Substation 7
523 - Vacant
524 - Commercial Vehicle Holding Area Building
525 - Triturator
526 - Terminal 5 Pumping Station
527 - Delta Air Freight
560 - Alamo/National Car Rental Maintenance
561 - Post #11 Guardhouse
562 - Hertz Car Rental Check-in & Administration
563 - Remote Parking ATS Station
564 - Avis Car Rental Check-in
565 - Traction Power Substation C / Facility Power Substation 5
566 - Hertz Gas Island
567 - Rent-a-Car ATC / UPS Building
568 - Avis Gas Island
569 - Dollar Rent-A-Car
570 - National Car Rental Administration
571 - Facility Power Substation 6
572 - Hertz Car Rental Maintenance
573 - Hertz North Customer Service Building
574 - Avis Car Rental Administration & Maintenance
580 - Budget Rent-a-Car Administration
581 - O'Hare Metra Transfer Station
582 - Post #3 Guardhouse (Centerpoint)
583 - AMC Airline Employee Lot Guardhouse

South Cargo Area (600)

600 - U.S. Postal Service Air Mail Facility (AMF)
601 - Post #5 Guardhouse
602 - A.R.F.F. Station #1
603 - Air Cargo Simulation Facility
604 - South Airfield Lighting Vault
605 - Post #5A Guardhouse
606 - Fueling Station
608 - Electrical Utilities
609 - American Airlines Cargo Building
610 - United Airlines Cargo Building
611 - Federal Express Metroplex Building
612 - Federal Express Freight Building
613 - Northwest Cargo Building
614 - United Parcel Service
616 - Lufthansa Cargo Building
617 - Air France Cargo Building
618 - KLM Royal Dutch Cargo Building
619 - Federal Express Guardhouse
620 - Federal Express Fueling System
621 - Federal Express Maintenance Building
660 - U.S. Postal Service Processing and Distribution Center (PDC)
663 - Nippon Cargo Airlines

Maintenance Hangar Area (700)

700 - Post #1 Guardhouse
701 - DOA Communications Service Center
702 - A.R.F.F. Station #2
703 - A.R.F.F. Training Pump House
704 - A.R.F.F. Training Control Center
705 - Post #2 Guardhouse
706 - Explosive Chamber
707 - A.R.F.F. Propane Tanks
708 - Commonwealth Edison Substation
709 - North Airfield Stormwater Pump Station (Winter Basin Pump Station)
710 - United Airlines Service Center
711 - A.R.F.F. Training Simulator
712 - United Airlines Boiler & Pumphouse
721 - North Airfield Lighting Vault
722 - AAL Fire Pump House
723 - AAL Ground Equipment Maintenance (GEM) Building
724 - AAL Fire Pump House
725 - AAL Maintenance Hangar #2
726 - AAL Triturator
727 - AAL Maintenance Hangar #1
728 - Sanitary Lift Station
729 - UAL Ground Equipment Maintenance (GEM) Building
732 - AAL Fire Pump House
741 - Gate Gourmet Flight Kitchen (#1)
742 - Gate Gourmet Flight Kitchen (#2)
746 - UAL Office and Medical Personnel Building
750 - UAL Hangar 5/5A (Maintenance Facility)
751 - Delta Maintenance Hangar
753 - Pump House
755 - Northwest Maintenance
757 - UAL Maintenance
760 - Northwest-American Maintenance Facility
761 - Ground Run-up Enclosure
762 - Pump House
770 - UAL Maintenance Facility
780 - Continental Airlines Vehicle Maintenance
790 - AGI Main Building (Lockheed Building)
795 - Fuel Farm
797 - Fuel Farm Pump House
798 - Airport Repair and Construction (ARC) Complex

Northeast Development Area (800)

800 - Signature Flight Services Terminal
891 - City (DOA) Warehouse / Skilled Trade Center
893 - Building #3 (Vacant/No Tenant)
899 - Department of Homeland Security

Navaids & Support Area (900)

901 - Meter House
902 - FAA Remote Transmitter/Receiver C
903 - Beside Coleman Lift Station
904 - FAA Localizer Transmitter (14L)
905 - FAA Localizer Building Site (14L)
907 - FAA Localizer Building Site (9L)
908 - FAA Glide Slope Site (27R)
909 - FAA Glide Slope Site (32R)
910 - FAA Localizer Building Site (4L)
912 - United Airlines Reservation Center
913 - United Airlines Credit Union
915 - FAA Glide Slope Site (22R)
920 - Willow-Higgins Pump Station (ST140)
921 - Power Vault
922 - FAA Vortac Site
923 - FAA Remote Center Air/Ground (RCAG) Facility
925 - FAA Glide Slope Site (14L)
926 - Meter House
927 - ALS Substation (14L) 32R Localizer Building
928 - FAA Middle Marker (14L)
929 - Canine Patrol Service
930 - FAA Glide Slope Site (9L)
931 - Meter House
932 - Monitor Site
933 - FAA Localizer Building Site (32L)
935 - FAA Glide Slope Site (14R)
936 - Radar Building and Tower (ASR-9)
938 - FAA Building
940 - FAA Localizer Building Site (27R)
954 - Middle Marker (9R)
956 - FAA Remote Transmitter / Receiver - ORD
957 - FAA Localizer Building Site (22R)
958 - FAA Glide Slope Site (9R)
959 - North Pump Station
961 - Electrical Vault, Fan Rooms 1 & 2
962 - FAA Glide Slope Site (32L)
963 - Sump Pump Motor Shed
964 - FAA Remote Transmitter / Receiver A
966 - FAA Localizer Building Site (14R)
967 - Substation
968 - FAA Localizer Building Site (22L)
971 - Oil Separator #1
973 - Oil Separator #2
975 - AAL - Ground Service Equipment (GSE) Building
976 - FAA Glide Slope Site (4R)
977 - Lake O'Hare Outfall Station
979 - Aeration System Blower House
980 - Oil Separator #3
981 - Pump House (Inactive)
982 - South Drainage Lift Station
984 - FAA Remote Transmitter / Receiver B
985 - FAA Glide Slope Site (27L)
987 - Lockheed Maintenance Facility
988 - Truck Fuel Stand & Airline Glycol Facility
989 - Super Fuel Sale/Rte
990 - City Warehouse - Berteau Avenue
991 - FAA Glide Slope Site (22L)
992 - FAA Localizer Building Site (9R)
994 - FAA Localizer Building Site (4R)
995 - East Meter House
996 - Southeast Meter House
997 - Daytona Beach Lift Station
998 - Domestic Water Station
999 - LAAS Electronics Shed

Water Tank Area (1700)

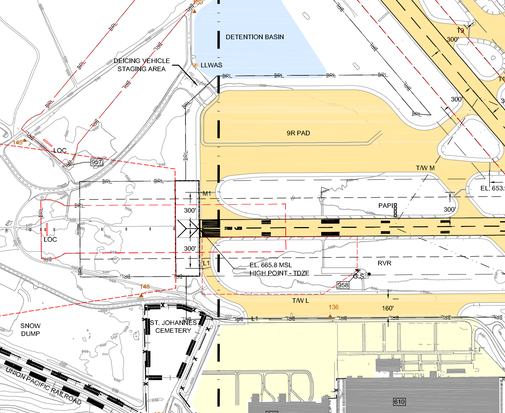
1700 - Vacant (Fire Protection Water Storage - 680,000 Gallons)
1701 - Vacant (Water Storage - 680,000 Gallons)
1702 - Water Storage (730,000 Gallons)
1709 - Fire Protection Water Storage (680,000 Gallons)

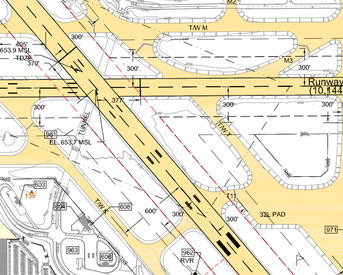
Former Military Area (8000)

8001 - Fire Water Pump Station
8004 - Former Administrative Offices Non-AFC (DLA)
8007 - Offices (Former Comm. Electronics Facility)
8008 - Electric Power Shed
8010 - Offices and Vehicle Shop (Former 928th Civil Engineering / Maintenance Shop / BX)
8018 - Polar Air Cargo (Former ANG Flightline Maint.)
8019 - Snow Equipment Hangar (Former ANG Hangar)
8023 - ODP/Records Warehouse
8024 - Laborers Equipment Storage
8030 - VIP Arrivals Hangar
8032 - Truck Dock (Former Supply Warehouse)
8034 - Laborers Shop
8043 - Fuel Farm Pump House
8044 - Fuel Operations Building
8045 - Fuel Farm Storage Shed
8046 - Fuel Farm (No Tanks)
8048 - Pump Shed
8053 - Hazardous Storage Shed
8055 - Vehicle Services Storage (#1)
8056 - Vehicle Services Storage (#2)
8058 - Heating Facility
8059 - Offices and Shop
8060 - Operations Facility
8063 - A.R.F.F. Station #4
8065 - DHL Airborne Express Hangar (Former Fuel System Maint.)
8067 - Vacant (Former Training Aid Shop)
8070 - Vehicle Services (Former Hangar Shop)
8072 - Vacant (Former Jet Engine Test Stand)
8087 - Fuel Storage Shed
8104 - Heating Facility Shed
8133 - Guard Post
8500 - Central Field Office (CFO)
8501 - Guard Post
8600 - Salt Dome
8998 - Vacant (Former U.S. Army Reserve Garage)
8999 - Vacant (Former U.S. Army Reserve)

RUNWAY SURFACES TABLE

RUNWAY	APPROACH VISIBILITY MINIMUMS (RVR)	AIRCRAFT GROUP	END EL. (MSL)	RSA / OFA			RPZ				OFZ			
				C	P/R	Q	W_1	W_2	L	Z	D	G	H	Y
9L	2400'	D-V	660	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	39'	n/a
27R	1800'	D-V	650	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	39'	n/a
9R	1800'	D-V	666	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	39'	n/a
27L	1800'	D-V	651	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	39'	n/a
14L	600'	D-V	653	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	18'	706'
32R	1800'	D-V	648	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	35'	n/a
14R	600'	D-VI	666	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	24'	654'
32L	1800'	D-VI	649	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	39'	654'
4L	5000'	D-V	656	500'	1,000'	800'	500'	1,010'	1,700'	200'	400'	n/a	39'	n/a
22R	2400'	D-V	648	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	39'	n/a
4R	2400'	D-V	661	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	39'	n/a
22L	2400'	D-V	654	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	39'	n/a
18	VISUAL	B-II	646	150'	300'	500'	500'	700'	1,000'	200'	400'	n/a	n/a	n/a
36	VISUAL	B-II	653	150'	300'	500'	500'	700'	1,000'	200'	400'	n/a	n/a	n/a





EXISTING AIRPORT LAYOUT PLAN

(PRELIMINARY REVIEW)

Richard M. Daley
Mayor
City of Chicago

Rosemarie S. Andolino
Executive Director
O'Hare Modernization Program

No	Revisions	Date

O'Hare International Airport

MAGNETIC NORTH DECLINATION = 2.8° W (SEPTEMBER 23, 2003)
TRUE NORTH
0 300 600 1200
GRAPHICAL SCALE IN FEET
ALL DRAWING ELEVATIONS IN FEET

DRAWN BY: EB
CHECKED BY: FG
PREPARED BY: Ricondo & Associates, Inc.
May 2005
Sheet 2 of 50

Drawing: Z:\Chicago\ORD\OMP\ALP-DrawingSet-FINAL-2005 \ALP Set\02-ORD-Existing.dwg_Layout: ALP-Existing_May 19, 2005, 5:50pm

APPENDIX G

Chicago O'Hare International Airport
Future Airport Layout Plan – October 2003

NOTES

1) ALL TAXIWAY LABELS REFER TO EXISTING AIRFIELD ONLY. NO FUTURE TAXIWAY LABELS HAVE BEEN ASSIGNED.

2) SPECIFIC SITING FOR FUTURE RELOCATED BUILDINGS MAY VARY WITHIN FUTURE AVIATION DEVELOPMENT AREAS.

3) THE GRAY BASE MAP SHOWING EXISTING INFORMATION IS BASED ON PRECISE AERIAL PHOTOGRAPHY FROM NOVEMBER 2001.

4) RUNWAY 10L LANDING DISTANCE AVAILABLE (LDA) = 12,246 FEET.

5) RUNWAY 10C LANDING DISTANCE AVAILABLE (LDA) = 10,540 FEET.

6) SPECIFIC SITING OF FUTURE UNDERGROUND AUTOMATED PEOPLE MOVER STATIONS AND PEDESTRIAN TUNNELS WILL BE DEFINED AFTER ADDITIONAL ANALYSIS.

7) NO OFZ OBJECT PENETRATIONS.

8) NO THRESHOLD SITING SURFACE OBJECT PENETRATIONS.

9) MODE OF ACCESS AND ROUTE TO APPROACH LIGHTS BEYOND THIS POINT NOT SHOWN. ACCESS WILL BE PROVIDED AND DETAILS WILL BE FINALIZED DURING FACILITY DESIGN.

10) SBC WILL RELOCATE SWITCH BUILDING (464) AND GARAGE (466) TO EXISTING OFF-AIRPORT FACILITY.

11) ALL EXISTING RENTAL CAR FACILITIES WILL BE RELOCATED FROM RUNWAYS 27C AND 27L RPZ.

12) FUTURE SOUTH AIR TRAFFIC CONTROL TOWER LOCATION SUBJECT TO FURTHER ANALYSIS.

13) ON-AIRPORT SURVEY MONUMENTS INSTALLED WITH CARSONITE SURVEY MARKERS AND LABELED "DO NOT DESTROY".

14) EXISTING RAILROAD INFRASTRUCTURE WILL BE DEMOLISHED AS REQUIRED.

15) ALL EXISTING MILITARY FACILITIES WILL BE DEMOLISHED.

16) ALL NON-AIRPORT FACILITIES WITHIN THE FUTURE AIRPORT PROPERTY LINE WILL BE DEMOLISHED AS REQUIRED FOR NEW AIRPORT FACILITIES.

17) ALL EXISTING NAVAID FACILITIES WILL BE RELOCATED OR REMOVED AS REQUIRED FOR FUTURE FACILITIES.

Terminal Area (000 - 400)

101 - Pedestrian Tunnel 1A
102 - Pedestrian Tunnel 1B
110 - Terminal 1, ATS Station (ATS-T1)
111 - Facility Power Substation 1 & 2
112 - Terminal 1, UPS Building
121 - Terminal 1
122 - Concourse B
124 - Concourse A
125 - Terminal 1 Baggage & Pedestrian Tunnel
126 - Concourse C
190 - Post #7 Guardhouse
200 - Terminal 2 (Building #4)
201 - Pedestrian Tunnel 2A
202 - Pedestrian Tunnel 2B
203 - Pedestrian Tunnel 2C
204 - Pedestrian Tunnel 2D
205 - Concourse E/F & Concourse E/F Link
206 - Terminal 2, ATS Station (ATS-T2)
207 - Terminal 2, UPS Building
210 - Concourse E
215 - Concourse F
230 - Post #8 Guardhouse
250 - Rotunda (Building #6)
260 - Concourse G (Building #7)
290 - Post #9 Guardhouse
300 - Terminal 3 (Building #8)
303 - Pedestrian Tunnel 3A
304 - Pedestrian Tunnel 3B
305 - Concourse H/K & Concourse H/K Link
306 - Pedestrian Tunnel 3C
307 - Pedestrian Center #7
310 - Concourse H
315 - Concourse K
320 - Concourse L
321 - Traction Power Substation A / Facility Power Substation 3
322 - Terminal 3 UPS Building
323 - Terminal 3 ATS Station (ATS-T3)
324 - International Terminal 5 ATS Station
325 - International Terminal 5 / Concourse M
330 - Post #10 Guardhouse
400 - FAA Air Traffic Control Tower (Decommissioned in 1996)
402 - New FAA Air Traffic Control Tower / ASDE (Completed in 1996)
405 - Hilton Hotel
406 - Traction Power Substation B / Facility Power Substation 4
407 - Pump House - Terminal 5
410 - Elevated Parking Structure (EPS)
411 - Transportation Center Boiler House
412 - Transportation Center
425 - Pump House - Parking Lot (Fire)
427 - Pump House Stairway Enclosure
430 - North Block House
432 - Intake Room #1
437 - Exhaust Room #2
438 - Exhaust Room #1
440 - Intake Room #2
441 - CTA Service Entrance
442 - Bus Dispatch
443 - CTA Air Intake
450 - H & R Building
452 - Chlorine Chemical Storage Building
454 - Acid Chemical Storage Building
456 - South Cooling Tower
457 - Southeast Cooling Tower
458 - FAA Microwave Tower and Building
460 - North Cooling Tower
462 - Commonwealth Edison Switchyard
464 - SBC Building
466 - SBC Garage
472 - City Substation RB-40 Building
474 - CTA Substation
475 - A.R.F.F. #3
480 - Taxiway Bridge Lift Station
490 - Sprinkler Control Room

Southeast Service Area (500)

500 - Post #4A Guardhouse
501 - Salt Storage
502 - Airport Maintenance Complex (AMC)
503 - Salt Storage
504 - Gate Gourmet Flight Kitchen
505 - City Glycol & Runway Deicer Facility
506 - AMC Annex
507 - City Gas Stand
509 - Post #4 Guardhouse
510 - Vacant (Former LYNX / Chicago Air Cargo)
511 - Sky Chef Flight Kitchen
513 - BAX Global (Former Burlington Northern)
514 - U.S. Post Office - International
515 - DHL / Air Canada
516 - JAL / EVA / BA Cargo
517 - Korean Air Cargo
519 - Police - CPD (Former City Warehouse)
521 - Vacant (Former Signature Flight Services Terminal)
522 - ATS Maintenance & Storage Facility Building / Facility Power Substation 7
523 - Vacant
524 - Commercial Vehicle Holding Area Building
525 - Triturator
526 - Terminal 5 Pumping Station
527 - Delta Air Freight
560 - Alamo/National Car Rental Maintenance
561 - Post #11 Guardhouse
562 - Hertz Car Rental Check-In & Administration
563 - Remote Parking ATS Station
564 - Avis Car Rental Check-In
565 - Traction Power Substation C / Facility Power Substation 5
566 - Hertz Gas Island
567 - Rent-a-Car ATC / UPS Building
568 - Avis Gas Island
569 - Dollar Rent-A-Car
570 - National Car Rental Administration
571 - Facility Power Substation 6
572 - Hertz Car Rental Maintenance
573 - Hertz North Customer Service Building
574 - Avis Car Rental Administration & Maintenance
580 - Budget Rent-a-Car Administration
581 - O'Hare Metra Transfer Station
582 - Post #3 Guardhouse (Centerpoint)
583 - AMC Airline Employee Lot Guardhouse

South Cargo Area (600)

600 - U.S. Post Office
601 - Post #5 Guardhouse
602 - A.R.F.F. Station #1
603 - Air Cargo Simulation Facility
604 - South Airfield Lighting Vault
605 - Post #5A Guardhouse
606 - Fueling Station
608 - Electrical Utilities
609 - American Airlines Cargo Building
610 - United Airlines Cargo Building
611 - Federal Express Metroplex Building
612 - Federal Express Freight Building
613 - Northwest Cargo Building
614 - United Parcel Service
616 - Lufthansa Cargo Building
617 - Air France Cargo Building
618 - KLM Royal Dutch Cargo Building
619 - Federal Express Guardhouse
620 - Federal Express Fueling System
621 - Federal Express Maintenance Building

Maintenance Hangar Area (700)

700 - Post #1 Guardhouse
701 - DOA Communications Service Center
702 - A.R.F.F. Station #2
703 - A.R.F.F. Training Control Center (Building #1)
704 - A.R.F.F. Training Pump House (Building #2)
705 - Post #2 Guardhouse
706 - Explosive Chamber
708 - Commonwealth Edison Substation
710 - United Airlines Service Center
712 - United Airlines Boiler & Pumphouse
721 - North Airfield Lighting Vault
722 - AAL Fire Pump House
723 - AAL Ground Equipment Maintenance (GEM) Building
724 - AAL Fire Pump House
725 - AAL Maintenance Hangar #2
726 - AAL Triturator
727 - AAL Maintenance Hangar #1
728 - Sanitary Lift Station
732 - AAL Fire Pump House
741 - Gate Gourmet Flight Kitchen (#1)
742 - Gate Gourmet Flight Kitchen (#2)
744 - UAL Ground Equipment Maintenance (GEM) Building
746 - UAL Office and Medical Personnel Building
750 - UAL Hangar 5/5A (Maintenance Facility)
751 - Delta Maintenance Hangar
753 - Pump House
755 - Northwest Maintenance
757 - UAL Maintenance
760 - Northwest-American Maintenance Facility
761 - Ground Run-up Enclosure
762 - Pump House
770 - UAL Maintenance Facility
780 - Continental Airlines Maintenance
790 - AGI Main Building (Lockheed Building)
795 - Fuel Farm
797 - Fuel Farm Pump House
798 - Airport Repair and Construction (ARC) Complex

Northeast Development Area (800)

800 - Signature Flight Services Terminal
891 - City (DOA) Warehouse / Skilled Trade Center

Navaids & Support Area (900)

901 - Meter House
902 - FAA Remote Transmitter/Receiver C
903 - Bessie Coleman Lift Station
904 - FAA Localizer Transmitter (14L)
905 - FAA Localizer Building Site (14L)
907 - FAA Localizer Building Site (9L)
908 - FAA Glide Slope Site (27R)
909 - FAA Glide Slope Site (32R)
910 - FAA Localizer Building Site (4L)
912 - United Airlines Reservation Center
913 - United Airlines Credit Union
915 - FAA Glide Slope Site (22R)
920 - ST140 Pump Station
921 - Power Vault
922 - FAA Vortac Site
923 - FAA Remote Transmitter / Receiver F
925 - FAA Glide Slope Site (14L)
926 - Meter House
927 - ALS Substation (14L) 32R Localizer Building
928 - FAA Middle Marker (14L)
929 - Canine Patrol Service
930 - FAA Glide Slope Site (9L)
931 - Meter House
932 - Monitor Site
933 - FAA Localizer Building Site (32L)
935 - FAA Glide Slope Site (14R)
936 - Radar Building and Tower (ASR-9)
938 - FAA Building
940 - FAA Localizer Building Site (27R)
954 - Middle Marker (9R)
956 - FAA Remote Transmitter / Receiver - ORD
957 - FAA Localizer Building Site (22R)
958 - FAA Glide Slope Site (9R)
959 - North Pump Station
961 - Electrical Vault, Fan Rooms 1 & 2
962 - FAA Glide Slope Site (32L)
963 - Sump Pump Motor Shed
964 - FAA Remote Transmitter / Receiver A
966 - FAA Localizer Building Site (14R)
967 - Substation
968 - FAA Localizer Building Site (22L)
971 - Oil Separator #1
973 - Oil Separator #2
975 - AAL - Ground Service Equipment (GSE) Building
976 - FAA Glide Slope Site (4R)
977 - Lake O'Hare Outfall Station
979 - Aeration System Blower House
980 - Oil Separator #3
981 - Pump House
984 - FAA Remote Transmitter / Receiver B
985 - FAA Glide Slope Site (27L)
987 - Lockheed Maintenance Facility
988 - Truck Fuel Stand & Airline Glycol Facility
989 - Super Fuel Satellite
990 - City Warehouse - Berteau Avenue
991 - FAA Glide Slope Site (22L)
992 - FAA Localizer Building Site (9R)
994 - FAA Localizer Building Site (4R)
995 - East Meter House
996 - Southeast Meter House
997 - Daytona Beach Lift Station
998 - Domestic Water Station
999 - LAAS Electronics Shed

Water Tank Area (1700)

1700 - Vacant (Fire Protection Water Storage - 680,000 Gallons)
1701 - Vacant (Water Storage - 680,000 Gallons)
1702 - Water Storage (730,000 Gallons)
1709 - Fire Protection Water Storage (680,000 Gallons)

Former Military Area (8000)

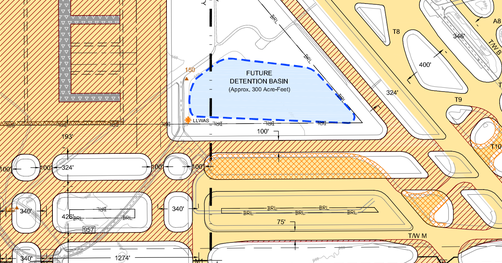
8001 - Fire Water Pump Station
8004 - Former Administrative Offices Non-AFC (DLA)
8007 - Offices (Former Comm. Electronics Facility)
8008 - Electric Power Shed
8010 - Offices and Vehicle Shop (Former 928th Civil Engineering / Maintenance Shop / BX)
8017 - Vacant Storage/Office (Former Band Center)
8018 - Pollar Air Cargo (Former ANG Flightline Maint.)
8019 - Snow Equipment Hangar (Former ANG Hangar)
8021 - Vacant Hazardous Storage (#1)
8022 - Vacant Hazardous Storage (#2)
8023 - ODP/Records Warehouse
8024 - Laborers Equipment Storage
8025 - Vacant Offices (Former ANG Security So Ops.)
8026 - Vacant Offices/Garage (Former ANG Maint. Shop)
8027 - Vacant Offices (Former Avionics Shop)
8028 - Offices (Former Crew Readiness Facility)
8029 - Parking Shed
8030 - VIP Arrivals Hangar
8031 - Electricians Shop (Former Corrosion Shop)
8032 - Truck Dock (Former Supply Warehouse)
8033 - Storage Facility
8034 - Laborers Shop
8039 - Vacant (Former Dining Hall & Firing Range)
8040 - CPD Training
8041 - CPD Training
8042 - CPD Training
8043 - Fuel Farm Pump House
8044 - Fuel Operations Building
8045 - Fuel Farm Storage Shed
8046 - Fuel Farm (No Tanks)
8048 - Pump Shed
8051 - Vacant (Former C & E Training)
8053 - Hazardous Storage Shed
8055 - Vehicle Services Storage (#1)
8056 - Vehicle Services Storage (#2)
8057 - Vacant Supply Warehouse
8058 - Heating Facility
8059 - Offices and Shop
8060 - Operations Facility
8061 - Vehicle Equipment Shop
8063 - A.R.F.F. Station #4
8065 - DHL Airborne Express Hangar (Former Fuel System Maint.)
8067 - Vacant (Former Training Aid Shop)
8070 - Vehicle Services (Former Hangar Shop)
8072 - Vacant (Former Jet Engine Test Stand)
8073 - Guardpost
8074 - Asphalt Equipment Facility (Winter Only)
8075 - Vehicle Parking Shed
8077 - Heating Facility (Incinerator)
8080 - Storage Canopy
8086 - Vacant Warehouse
8087 - Fuel Storage Shed
8104 - Heating Facility Shed
8133 - Guard Post
8412 - Hazardous Storage Facility
8500 - Central Field Office (CFO)
8501 - Guard Post
8504 - Vacant (Former Reserve Med. Training)
8600 - Salt Dome
8998 - Vacant (Former U.S. Army Reserve Garage)
8999 - Vacant (Former U.S. Army Reserve)

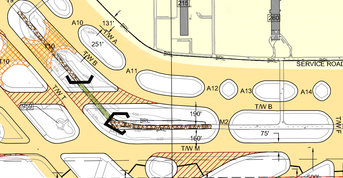
FACILITY LIST

A1	ATS MAINTENANCE YARD (522)	R17	FUTURE SOUTH AIRFIELD LIGHTING VAULT (604) ELECTRICAL UTILITIES (608)
A2	FUTURE APM MAINTENANCE YARD AND STORAGE		
P1	FUTURE EMPLOYEE PARKING	R18	FUTURE AIR CARGO SIMULATION FACILITY (603)
P2	FUTURE LONG TERM PARKING	R19	FUTURE FUELING STATION (606)
P3	FUTURE RENTAL CAR FACILITY	R20	FUTURE DELTA AIR FREIGHT (527)
P4	FUTURE SHORT TERM PARKING	R21	FUTURE SIGNATURE FLIGHT SERVICES TERMINAL (800)
P6	RELOCATED LIMO SERVICE CENTER	R22	FUTURE COOLING TOWERS (SOUTH-456, SOUTHEAST-457 AND NORTH-460)
P7	FUTURE TAXI STAGING		
P8	TRUCK STAGING	R23	FUTURE GROUND RUN-UP ENCLOSURE (761)
P9	FUTURE QUICK TURN AREA	R24	FUTURE AAL FIRE PUMP HOUSE (732)
T10	NORTHWEST EMPLOYEE LOT CHECKPOINT	R25	FUTURE ROTATING BEACON
R1	FUTURE TRAINING FACILITY (706)	R26	FUTURE ASR-9
R2	FUTURE UAL HANGAR 5/5A (750)	R27	FUTURE VOR/DME
R3	FUTURE UAL GROUND EQUIP. MAINTENANCE BLDG (744)	R28	FUTURE LAAS
R4	FUTURE DOA COMMUNICATIONS CENTER (701)	R29	FUTURE ASOS
R5	FUTURE UAL OFFICE AND MEDICAL PERSONNEL BLDG (746)	R30	FUTURE D177, RB40, & CTA SUBSTATION (462, 472 & 474)
R7	FUTURE SKY CHEF FLIGHT KITCHEN (511)	R31	FUTURE AIRPORT REPAIR AND CONSTRUCTION COMPLEX (ARC) (798) / MULTIWASTE FACILITY
R8	FUTURE AAL MAINTENANCE HANGAR #2 (725)		
R9	FUTURE AAL GROUND EQUIP. MAINTENANCE BLDG (723)	S1	COMMONWEALTH EDISON SWITCH YARD
R10	FUTURE DOBBS FLIGHT KITCHEN #1 (741)	S2	HEATING & REFRIGERATION/CO-GENERATION FACILITY
R11	FUTURE DOBBS FLIGHT KITCHEN #2 (742)	T1	FUTURE TERMINAL 6
R12	FUTURE A.R.F.F. STATION #2 (702)	T2	FUTURE TERMINAL 4
R13	FUTURE CARGO DEVELOPMENT (510)	T3	FUTURE K CONCOURSE EXTENSION
R14	FUTURE UNITED AIRLINES CARGO BLDG (610)	T4	FUTURE TERMINAL 7 SATELLITE CONCOURSE
R15	FUTURE FEDERAL EXPRESS MAINTENANCE BLDG (621)	T5	FUTURE TERMINAL 7 / CONCOURSE
R16	FUTURE FEDERAL EXPRESS METROPLEX BLDG (611)	T6	FUTURE TERMINAL 7 PEDESTRIAN BRIDGE

RUNWAY SURFACES TABLE

RUNWAY	APPROACH VISIBILITY MINIMUMS (RVR)	AIRCRAFT GROUP	END EL. (MSL)	RSA / OFA			RPZ				OFZ			
				C	P/R	Q	W_1	W_2	L	Z	D	G	H	Y
9L	600'	D-V	662.0	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	24'	654'
27R	600'	D-V	660.5	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	24'	654'
9C	600'	D-VI	668.3	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	18'	706'
27C	600'	D-VI	652.4	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	18'	706'
9R	600'	D-V	668.2	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	24'	654'
27L	600'	D-V	650.3	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	24'	654'
10L	600'	D-V	665.8	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	24'	654'
28R	600'	D-V	651.3	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	24'	654'
10C	600'	D-VI	665.8	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	18'	706'
28C	600'	D-VI	650.0	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	18'	706'
10R	600'	D-V	662.7	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	24'	654'
28L	600'	D-V	658.0	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	24'	654'
4L	5000'	D-V	655.8	500'	1,000'	800'	500'	1,010'	1,700'	200'	400'	n/a	n/a	n/a
22R	2400'	D-V	647.7	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	39'	n/a
4R	2400'	D-V	661.2	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	39'	n/a
22L	2400'	D-V	654.4	500'	1,000'	800'	1,000'	1,750'	2,500'	200'	400'	2,400'	39'	n/a





LEGEND

- EXISTING AIRFIELD PAVEMENT
- FUTURE AIRFIELD PAVEMENT
- AIRFIELD PAVEMENT DEMOLITION
- EXISTING APRON PAVEMENT
- EXISTING AIRPORT BUILDING
- FUTURE TERMINAL BUILDING
- EXISTING AIRPORT BUILDINGS IN AOA TO BE RELOCATED
- RELOCATED AIRPORT BUILDINGS PREVIOUSLY IN AOA
- FUTURE AIRPORT BUILDING
- FUTURE AIRPORT FACILITY
- FUTURE AVIATION DEVELOPMENT
- FUTURE ROADWAYS
- FUTURE STRUCTURED PARKING
- FUTURE SURFACE PARKING
- FUTURE COLLATERAL DEVELOPMENT
- EXISTING AVIGATION EASEMENT
- FUTURE AVIGATION EASEMENT
- CURRENTLY PLANNED NON-AIRPORT ROADWAY PROJECT
- FUTURE AIRPORT PROPERTY LINE
- EXISTING AIRPORT PROPERTY LINE
- COUNTY LINE
- MONUMENTS
- WIND CONE
- INNER MARKERS (IM)
- FAR FIELD MONITORS (FFM)
- AIRPORT REFERENCE POINT
- LOW-LEVEL WINDSHEAR ALERT SYSTEM ANTENNA
- EXISTING GUARD POSTS
- FUTURE GUARD POSTS
- FUTURE CREEK - OPEN
- FUTURE CREEK - CULVERT
- FUTURE SERVICE ROAD
- FUTURE TUNNELS
- SERVICE ROAD UPGRADE
- FUTURE NAVAID/ARFF ACCESS ROAD
- RUNWAY PROTECTION ZONE
- RUNWAY SAFETY AREA
- OBJECT FREE AREA
- PRECISION OBJECT FREE AREA
- BUILDING RESTRICTION LINE (BRL)
- AIR OPERATIONS AREA (AOA)
- RUNWAY VISIBILITY ZONE
- GLIDE SLOPE CRITICAL AREA
- LOCALIZER CRITICAL AREA
- EXISTING AIRPORT TRANSIT SYSTEM
- FUTURE AIRPORT TRANSIT SYSTEM
- AUTOMATED PEOPLE MOVER SYSTEM (UNDERGROUND)
- RELOCATED RAILROAD
- TOPOGRAPHICAL CONTOURS

O'Hare Modernization Program

CHICAGO Airport System — O'HARE, MIDWAY — RICHARD M. DALEY, MAYOR

FUTURE AIRPORT LAYOUT PLAN

APPROVED BY

FAA — Date

FAA Airspace Review No. : 2003-AGL-0848-NRA

City of Chicago — Date

No	Revisions	Date

O'Hare International Airport

MAGNETIC NORTH DECLINATION = 2.8° W (SEPTEMBER 21, 2003) — TRUE NORTH

0 300 600 1200

GRAPHICAL SCALE IN FEET
ALL DRAWING ELEVATIONS IN FEET

DRAWN BY: EB
CHECKED BY: FG
PREPARED BY: Ricondo & Associates, Inc.
October 2003
Sheet 3 of 50

Drawing: Z:\Chicago\ORD\OMP\ALP-DrawingSet-FINAL \03-ORD-Future.dwg_Layout: ALP-Future_Oct 07, 2003, 4:57pm